The Road to Recovery – understanding and improving the process of rebuilding seismic resistant schools in Nepal.

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Abstract

Many schools in Nepal were damaged or destroyed in the 2015 Gorkha earthquake, highlighting major vulnerabilities in Nepal's school infrastructure. Schools are particularly important within communities, providing education, and often acting as a centre for aid distribution and shelter following disasters. Therefore, it is vital that when these facilities are reconstructed, they have an improved resilience to enable them to resist future earthquake events. Since the 2015 earthquake, school reconstruction programmes have been initiated and there are examples of good school reconstruction both within Kathmandu and in some of Nepal's more remote areas. However, there are a wide range of challenges affecting this process, and evidence that knowledge transfer between stakeholders is limited, meaning that practices to reduce challenges are not being utilised in all projects, impeding successful and efficient construction.

This thesis presents data collected within two fieldwork visits to Nepal. These took the form of a pilot study to identify key challenges, and understand the broader context, followed by a phase two study, building on the pilot study findings, understanding the challenges in more detail, and identifying good practice to overcome or mitigate the challenges. Across the two visits, 20 interviews were conducted, with stakeholders at both a case-specific school level, and a high-level with broad involvement across multiple projects, in addition to other complementary research activities such as meeting with engineering professors, visiting case-specific schools, and visiting earthquake affected communities to explore broader resilience efforts. Six key challenges that affect the school reconstruction process have been identified: 1) accessibility and transportation, 2) skill and availability of labour, 3) quality and availability of materials, 4) suitability and availability of land, 5) community involvement, and 6) government processes. Of these, accessibility and transportation was the most frequently reported challenge, and had the greatest perceived impact, of 0.75 on a scale of zero to one. It was also found that different challenges were perceived differently by different stakeholder groups, and the impact varies relative to the contexts in which they occur. Good practices have also been identified, specific to the contexts in which they were implemented, and would be applicable, including: 1) training of labour, 2) training for SMCs, to better manage projects, 3) planning projects around the monsoon, for projects that are only accessible via seasonal roads, and 4) accounting for higher transportation costs to harder to reach sites.

Based on these findings, a decision-making framework has been created, to help stakeholders identify practices to improve project delivery, specific to the individual project context. The

process of producing this framework, and subsequent validation, conducted via an online questionnaire with nine stakeholders, are also presented. Five out of nine participants reported that most or all of the good practice recommended would have been suitable for the projects they considered, and eight out of nine reporting that the framework would be valuable for either themselves or less experienced stakeholders, if implemented within a project. A range of benefits of implementing the framework were reported, including: 1) better managing and planning projects, 2) bringing additional benefits to the school and community, 3) increasing the quality of construction, and 4) reducing delays. Utilising this framework within projects would therefore work to improve the resilience of Nepal's school infrastructure and assist in efforts to build back better and safer following the 2015 earthquake or future earthquake events.

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Table of Contents

Covid Impact Statement i
Abstract ii
Acknowledgements iv
Table of Contents v
List of figures ix
List of tables xii
Chapter 1. – Introduction 1
1.1. Earthquake damage in Nepal 1
1.1.1. Project aim and objectives 4
1.1.2. Project scope 5
1.2. Thesis chapter outline 6
Chapter 2. School Infrastructure in Nepal 9
2.1. Introduction 9
2.2. Typical school construction 9
2.2.1. Vulnerabilities in school construction 10
2.2.2. Typical urban school construction 12
2.2.3. Typical rural school construction 14
2.3. School upgrade efforts 15
2.3.1. Previous school improvement work in Nepal 15
2.4. Earthquake damage to school infrastructure 18
2.5. School reconstruction process 19
2.5.1. Stakeholder involvement 22
2.5.2. Concerns and challenges for reconstruction 26
2.5.3. Trends from other earthquakes 28
2.6. Disaster risk reduction and build back better 29
2.6.1. Disaster risk reduction frameworks 29
2.6.2. Development goals 31
2.6.3. Disaster risk reduction within Nepal's school reconstruction 32
2.7. Conclusion 33
Chapter 3. Methodology Literature Review 36
3.1. Introduction 36
3.2. Approach 36
3.3. Social science research methodologies 38
3.3.1. Questionnaires 39
3.3.2. Interviews 40

3.3.2.1. Structured interviews ... 41
3.3.2.2. Semi-structured interviews ... 42
3.3.2.3. Unstructured interviews ... 42
3.3.3. Focus groups ... 43
3.3.4. Observations and complementary work ... 44
3.3.5. Blended research and triangulating methods ... 45
3.3.6. Case studies ... 46
3.4. Study design ... 46
3.4.1. Validity and reliability ... 47
3.4.2. Question design ... 47
3.4.3. Participants ... 49
3.4.3.1. Number of participants ... 49
3.4.3.2. Choosing and sampling participants ... 50
3.4.4. Conducting the research ... 52
3.4.4.1. Fieldwork studies ... 52
3.4.4.2. Language barrier ... 53
3.4.4.3. Recording data ... 57
3.4.4.4. Research ethics ... 58
3.5. Data preparation and analysis ... 60
3.5.1. Transcribing recordings ... 60
3.5.2. Data analysis ... 61
3.5.2.1. Quantitative data analysis ... 62
3.5.2.2. Qualitative data analysis ... 63
3.6. Conclusion ... 68
Chapter 4. Phase One Fieldwork: Pilot Study ... 71
4.1. Introduction ... 71
4.2. Approach and methodology ... 71
4.2.1. Visit aim and objectives ... 71
4.2.2. Methodology ... 73
4.2.3. Interview schedules ... 77
4.3. Conducting phase one fieldwork ... 80
4.3.1. General research activities ... 81
4.3.2. Case-specific interviews and visits ... 83
4.3.3. High-level interviews ... 87
4.4. Results and discussion ... 89
4.4.1. Broader context ... 89
4.4.2. School damage and impacts of the earthquake ... 93

4.4.3. Coordination of school reconstruction projects 95
4.4.4. Construction materials 97
4.4.5. Project timescales...100
4.4.6. Labour 102
4.4.7. Challenges..103
4.4.7.1. Accessibility and transportation 106
4.4.7.2. Community involvement 107
4.4.7.3. Government processes..108
4.4.7.4. Skill and availability of labour...108
4.4.7.5. Quality and availability of materials 109
4.4.7.6. Suitability and availability of land 110
4.4.8. Good practice 111
4.4.9. Wider benefits of school reconstruction...113
4.5. Consideration for phase two research 114
4.5.1. Areas to investigate 114
4.5.2. Considerations for research methodology..115
4.6. Conclusion 116
Chapter 5. Phase Two Fieldwork.. 119
5.1. Introduction 119
5.2. Approach and methodology...119
5.2.1. Visit aim and objectives...119
5.2.2. Methodology 120
5.2.3. Interview schedules...124
5.3. Conducting phase two fieldwork..128
5.3.1. Case-specific schools 128
5.3.2. High-level interviews 133
5.3.3. Additional research activities 137
5.4. Results and discussion 138
5.4.1. Project delivery mechanisms and stakeholders..138
5.4.2. Challenges and good practice..143
5.4.2.1. Accessibility and transportation 149
5.4.2.2. Community involvement 150
5.4.2.3. Government processes..152
5.4.2.4. Skill and availability of labour...155
5.4.2.5. Quality and availability of materials 157
5.4.2.6. Suitability and availability of land 161
5.5. Conclusion 162

Chapter 6. Decision-Making Framework 166
6.1. Introduction 166
6.2. Catalogue of good practice 166
6.3. Decision trees 168
6.3.2. Accessibility and transportation 173
6.3.4. Community involvement 174
6.3.6. Quality and availability of materials 175
6.3.8. Suitability and availability of land 176
6.3.10. Skill and availability of labour 177
6.3.11. Government processes 177
6.4. Decision-making framework 179
6.4.1. Intended users 179
6.4.2. Producing the framework 184
6.5. Validation 187
6.5.1. Validation methodology 187
6.5.2. Validation exercise 189
6.5.3. Validation results 191
6.5.3.1. Accuracy of project context 191
6.5.3.2. Applicability of good practice 193
6.5.3.3. Value of the framework 195
6.5.3.4. Framework format 199
6.6. Implementation and scope for further work 201
6.6.1. Application within other contexts 203
6.7. Conclusion 204
Chapter 7. Conclusions and further work 207
7.1. Key conclusions 207
7.2. Further work 210
References 213
Appendix A. Journal paper 225
Appendix B. Fieldwork risk assessments 256
Appendix C. Fieldwork interview protocols 264
Appendix D. Pilot study interview schedules 269
Appendix E. Pilot study interview transcripts 286
Appendix F. Phase two interview schedules 334
Appendix G. Phase two interview transcripts 348
Appendix H. Catalogue of challenges, contexts, and good practice 501
Appendix I. Decision trees 539

Appendix J. Evaluation of options for combining decision trees 557
Appendix K. Validation questionnaire 563
Appendix L. Validation exercise results 567

List of figures

Figure 2-1 - Outline of recommended construction materials within type designs for school reconstruction in Nepal. Source: (ADB, 2016) 12
Figure 2-2 - A school in rural Sindhupalchowk, damaged by the 2015 Gorkha earthquake 19
Figure 2-3 - Temporary Learning Centre, at a school visited during the pilot study field visit, constructed on the original foundation using CGI sheeting for both walls and roof. 21
Figure 2-4 - Temporary Learning Centre, at a school visited during the pilot study field visit, constructed on the original foundations using bamboo and CGI sheeting for the roof. 21
Figure 2-5 - Progress of school reconstruction in Nepal following the 2015 Gorkha earthquake, from April 2017 to February 2020, shown as schools completed, schools underway, and the total (out of the 7,553 target schools to be reconstructed) Source: (National Reconstruction Authority, 2021).... 22
Figure 2-6 - Organisational structure of NRA. (Source: (NRA, 2016)) 25
Figure 3-1 - Process of conducting quantitative content analysis. Adapted from Lune & Berg (2017).65
Figure 4-1 - Meeting with staff from NSET, to discuss PhD research topics, and explore potential links with their work. (Source: Gopi Krishna) 83
Figure 4-2 - Meeting with staff from Practical Action, to discuss their ongoing work in the field of earthquake resilience (Source: Gopi Krishna) 83
Figure 4-3 - Meeting with academics at the Department of Geography, Tribhuvan University, to discuss their research and facilities (Source: Gopi Krishna) 83
Figure 4-4 - Receiving a tour of laboratories and facilities at the Department of Geography, Tribhuvan University (Source: Gopi Krishna) 83
Figure 4-5 - An urban school, on the outskirts of Kathmandu, reconstructed after the earthquake... 85
Figure 4-6 - A rural school, in the Sindhupalchowk district, reconstructed after the earthquake. 85
Figure 4-7 - Map showing the locations of the pilot study case-specific schools, along with the locations of the capital city, Kathmandu, and the locations of the epicentres of the April 25th, and May 12th 2015 earthquakes. 87
Figure 4-8 - Narrow passageways in Patan, creating unsafe evacuation routes. 90
Figure 4-9 - Construction on top of debris from previous disasters, blocking exits from buildings. 90
Figure 4-10 - Residential buildings in Patan, extended vertically, often without suitable engineering input, and is likely to cause structural inadequacies. 91
Figure 4-11 - Flush hinges on a classroom door at first SESP retrofitted school. These create less obstruction in the doorway, making it easier to evacuate. 91
Figure 4-12 - Reconstruction of a temple in Bhaktapur, replicating traditional construction methods. 91
Figure 4-13 - Soft-storey failure of a temple in rural Sindhupalchowk. 91
Figure 4-14 - Visiting a monitoring station in rural Sindhupalchowk, set up by Durham University. This records ground movement, in order to identify landslide hazards. 92
Figure 4-15 - Researchers from Durham University, using an Unmanned Aerial Vehicle (UAV) in rural Sindhupalchowk, to collect data used for landslide mapping. 92
Figure 4-16 - A rural road in Sindhupalchowk, cut into a soil slope face - these roads are non-engineered and are often unstable 92
Figure 4-17 - A rural road under construction in rural Sindhupalchowk, using an excavator to cut the road out of the side of a slope face. 92

Figure 4-18 - Visiting NSET's first retrofitted school, in Bhaktapur, completed in 1998, which was undamaged in the 2015 Gorkha earthquake. 94
Figure 4-19 - A school building at a case-specific school, retrofitted prior to the 2015 earthquake.... 94
Figure 4-20 - A school in rural Sindhupalchowk, buried in mud, as the school sits in the path of a debris flow - a secondary effect of the 2015 Gorkha earthquake. 94
Figure 4-21 - Earthquake damage to a school in rural Sindhupalchowk. There was out of plane failure of the wall panels, due to poor connection to the steel frame........ 94
Figure 4-22 - A Temporary Learning Centre, providing additional learning spaces at a damaged school in rural Sindhupalchowk, constructed with CGI sheeting. 95
Figure 4-23 – A Temporary Learning Centre at a case-specific school in rural Sindhupalchowk, constructed with bamboo and CGI sheeting. 95
Figure 4-24 - RC frame and fired brick infill wall school, constructed in Kathmandu. 98
Figure 4-25 - A fired brick school building, constructed in the outskirts of Kathmandu. 98
Figure 4-26 - RC frame with CSEB infill wall, in rural Sindhupalchowk. 99
Figure 4-27 - A pile of CSEB bricks, to be used in a local house construction. 99
Figure 4-28 - Chart showing the duration (in months) of reconstruction projects for the three completed schools, shown as the total duration, from project initiation to completion, and the construction period, from when construction work began through to completion of construction work. Note: for one of the unfinished projects, the total duration is estimated to be 5 months, and the construction period 4 months. 101
Figure 4-29 - Local labourers constructing a CSEB house in rural Sindhupalchowk. CSEB was also used to construct the village school, sharing the skills learnt. 102
Figure 4-30 - A local brick-making factory in rural Sindhupalchowk. Entrepreneurs receive training in producing CSEB bricks, to be used in construction. 102
Figure 4-31 - Reported challenges for case-specific schools. These have been grouped into the five main categories shown, so may reflect a number of reports of challenges in the same category, from an individual case study school. 105
Figure 4-32 - Challenges affecting school reconstruction in Nepal, reported within high-level interviews. The values represent the number of reports of challenges within a category, rather than the number of participants reporting that challenge. 105
Figure 4-33 - Challenges reported within the pilot study interviews, by high-level and case specific participants, split into the six common challenges to be investigated further in phase two. The values represent individual reports of each challenge. 105
Figure 4-34 - Reconstructing a road that had buried in a landslide, blocking transport routes. Landslides caused by the monsoon can cut off many roads each year. 107
Figure 4-35 - Trucks transporting sand and gravel collected from a river, to be used as construction materials. This may be transported to Kathmandu, or to surrounding local villages, on poor quality roads. 110
Figure 4-36 - A staircase at an urban school. The school wanted this constructed at the rear of the building, but due to poor land quality this was not possible. 111
Figure 4-37 - An accessible ramp constructed at an urban school in the outskirts of Kathmandu. ... 114
Figure 4-38 - A CSEB house within the same rural village as a CSEB case-specific school. 114
Figure 5-1 - Map showing the location of the six phase two case-specific schools (along with the pilot study case-specific schools for reference), and the locations of the capital city, Kathmandu, and the epicentres of the April 25th, and May 12th 2015 earthquakes. 129
Figure 5-2 - Challenges affecting school reconstruction in Nepal, reported within pilot study and phase two interviews. 144
Figure 5-3 - Challenges reported, as proportions of total reports, within the Visit 1 and 2 interviews, by participants in the high-level interviews, vs. participants in case specific interviews, scaled by the

relative impact of the challenge (shown in bubble size and value in each bubble). Impact values are between zero (no challenge) and one (major challenge). 146
Figure 5-4 - Relative impact of the six challenge categories, as reported within the high-level and case specific interviews, with the size of the bubbles scaled by the combined impact score as a mean of all responses (and shown in the value in each bubble). Impact values are between zero (no challenge) and one (major challenge). 146
Figure 5-5 - A seasonal road being reconstructed following a landslide, using an excavator (seen back left of the image)........ 151
Figure 5-6 - Sand and gravel being collected from a river, next to an existing school, for use in local construction. 151
Figure 5-7 - Construction materials stored in the open, on land students previously used for outdoor activities. 162
Figure 5-8 - A school in north Sindhupalchowk, damaged by debris flows 162
Figure 6-1 - An individual branch of the original decision tree. This branch shows the judgement of how accessible a school is, based on its location and the road provision to the site, within the accessibility and transportation challenge category. Blue depicts questions that must be answered, orange depicts the different options, to classify an aspect of the project's context, and green represents the appropriate good practice for that specific context........ 170
Figure 6-2 - A count of the total number of individual items of good practice to be included in the decision trees, within each of the six challenge categories........ 171
Figure 6-3 – One branch of the accessibility decision tree, assessing the storage available at the site, following the consideration of seasonal roads, which can impact on feasibility of transporting materials........ 173
Figure 6-4 – One branch of the community involvement decision tree, detailing communication practice for different roles. 174
Figure 6-5 – One branch of the materials decision tree, depicting the good practice for sourcing materials, dependent on broader involvement in projects in the same region. 175
Figure 6-6 – One branch of the land decision tree, depicting the good practice dependent on the availability of a water source near the site. 176
Figure 6-7 – One branch of the labour decision tree, depicting the good practice for engaging labourers across multiple projects, dependent on the timeframes of the projects........ 177
Figure 6-8 – One branch of the government decision, depicting responsibilities and good practice dependent on the role of the stakeholder, including a subsequent branch for the government stakeholder response, assessing immediate involvement with schools immediately after an earthquake. 178
Figure 6-9 - Excerpt of the decision-making tool, showing one branch of the labour decision tree. This shows the good practice recommended for the option selected ('No') (from the previous question 'Will you be working of multiple projects in a similar area?'), followed by the subsequent question and potential answers from the decision tree up. The options are hyperlinked to the relevant slides for the recommended good practice and next follow up question. 186
Figure 6-10 - Excerpt of the decision-making tool, showing the end of one route through the labour decision tree. This shows the summary of all the good practice recommended along the pathway, a summary of the context this is applicable to, and the hyperlinked option to progress to the next stage of the tool, considering the next challenge category. 186
Figure 6-11 - The roles of the nine participants within the validation exercise. 189
Figure 6-12 - Validation results showing how accurately the tool was able to match the actual project context. 193
Figure 6-13 - Validation results showing how much of the good practice recommended within the tool was actually implemented within projects participants were considering. 194

Figure 6-14 - Validation results showing participant ratings of how suitable the good practice recommended would have been within the specific project context they were considering. 195
Figure 6-15 - Validation results showing participants ratings of how helpful the tool would be, if implemented within projects, either by themselves, or by other less experienced stakeholders. 197
Figure 6-16 - Validation results showing the number of participants who indicated each of the options as a potential benefit of implementing the tool within a project (out of nine participants). 198
Figure 6-17 - Validation results showing how participants rated how easy or hard it was to navigate the tool. 199
Figure 6-18 - Validation results showing how participants rated the length of time it took to complete the tool. 201
Figure 6-19 – Mechanism for in-depth validation, dissemination and implementation of the decision-making framework. 202

List of tables

Table 4-1 - Overview of the five Pilot Study case specific schools 86
Table 4-2 - Overview of the five Pilot Study high-level interview participants 88
Table 4-3 – Overview of the types of issues encompassed within each of the six challenge classes shown in Figure 4-33. 106
Table 5-1 - Overview of the six phase two case-specific schools 131
Table 5-2 - Overview of Phase Two high-level interview participants, detailing their role and relevant experience, indicating the value they add to the sample and data collected 136
Table 5-3 - Stakeholder roles, identified by interview participants. 140
Table 5-4 - Summary of all of the sub-challenges reported in phase two, for each of the six challenge categories, alongside the relevant reported good practice 147
Table 6-1 - Examples of updated good practice provided in the decision trees (not exhaustive of all changes - for fully updated decision trees, refer to Appendix I) 168
Table 6-2 – A count of the total number of potential routes through each of the six decision trees. These represent the range of possible contextual scenarios depicted, relevant to each of the six challenges. 172
Table 6-3 – The levels of reporting of the good practice identified in accessibility decision tree branch shown in Figure 6-3. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable. 173
Table 6-4 - The levels of reporting of the good practice identified in community involvement decision tree branch shown in Figure 6-4. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable. 174
Table 6-5 - The levels of reporting of the good practice identified in materials decision tree branch shown in Figure 6-5. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable. 175
Table 6-6 - The levels of reporting of the good practice identified in land decision tree branch shown in Figure 6-6. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable. 176
Table 6-7 - The levels of reporting of the good practice identified in labour decision tree branch shown in Figure 6-7. This shows the number of reports from both high-level and case-specific

participants, as well as the number of reports of the associated challenge for which the good practice is suitable........ 177
Table 6-8 - The levels of reporting of the good practice identified in government decision tree branch shown in Figure 6-8. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable........ 178
Table 6--9 - User profiles for the decision-making framework, identifying the stakeholders who may use the framework, the roles they have within projects, the information they need when completing their roles, the tasks they would therefore perform within the framework, and potential sources of frustration they could have with the framework........ 182
Table 6-10 - Evaluation of the different potential framework formats........ 185

Chapter 1:

Introduction

Chapter 1. – Introduction

1.1. Earthquake damage in Nepal

On the 25th April 2015, Nepal suffered an Mw7.8 earthquake at 11:56 am NST (06:11:26 UTC), with the epicentre located in the Gorkha District, approximately 80 km northwest of Kathmandu (USGS, 2015b). This was followed by a series of aftershocks, most notably an Mw7.3 earthquake on 12th May 2015, to the east of Kathmandu (USGS, 2015a). The key statistics were reported in Nepal's post-disaster needs assessment, with more than 8,790 deaths and 22,300 injuries, estimating approximately one-third of Nepal's population affected (National Planning Commission - Nepal, 2015). The earthquake caused widespread devastation across 31 of the 75 districts in Nepal (32 after district restructuring); while these covered both urban and rural locations, the impacts were more extreme in rural areas (National Planning Commission - Nepal, 2015; Rotary International District 3292, 2015). Similar patterns have been mirrored within post-earthquake reconstruction efforts, with slower progress and less support in less accessible areas, despite the high levels of damage, and many additional challenges impeding reconstruction in these contexts (Goda, et al., 2015). The earthquake caused damage across all sectors, including transportation, medical facilities, and cultural and historic monuments such as temples (National Planning Commission - Nepal, 2015). Of the total damage, 58% has been attributed to the social sectors. While the majority of this was in the housing sector (with approximate 500,000 houses destroyed and a further 250,000 partially damaged), the extent of damages in the education sector is particularly concerning; 25,134 classrooms destroyed and 22,097 damaged across 8,242 public schools, and an additional 4,939 damaged or destroyed classrooms in private schools (National Planning Commission - Nepal, 2015). Vishokarma et al. (2012) estimate that approximately 60,000 public school buildings across Nepal lacked sufficient seismic resistance; this highlights that as well as the damaged schools in the earthquake-affected areas, there are major vulnerabilities within the education sector across the whole of Nepal, which need addressing in order to ensure safe, resilient school infrastructure.

This problem is not just restricted to Nepal. Across the world there have been many earthquakes that have caused significant damage to school infrastructure, and in some events, a high loss of life, indicating that there are global vulnerabilities in school construction (Rodgers, 2012). Over 15,000 children died in school collapses in the 2008 Sichuan earthquake (Alexander, et al., 2015). In the 2009 Padang earthquake, 4,748 schools suffered damage

(BNPB, 2009), including 70 per cent of schools in one district (Wilkinson, et al., 2012). During the 2011 East Japan earthquake, 6,284 schools were destroyed (although much of this can be attributed to the associated tsunami) (Alexander, et al., 2015). In the 2010 Haiti earthquake, education was one of the most affected sectors, with 1,352 schools destroyed and 2,916 damaged (World Bank, 2010); communities had no immediate access to education facilities (Hill, et al., 2011) and some schools were still closed after two and a half months (GOH, 2010). This is particularly concerning as schools play a vital role within communities, providing access to education, but also for the role they play during and after disasters, as a centre for aid distribution and shelter (Dixit, et al., 2014), and to aid children's recovery from the trauma experienced (Cheal, 2010). These roles are highlighted within the Global Program for Safer Schools, which defines a safe school as one that can withstand extreme disaster events without collapse and minimise loss of life, highlighting that while infrastructure may be damaged, failure should be localised and preserve evacuation routes (Cortes, 2017).

Rodgers (2012) highlights a wide range of issues with school construction globally, that lead to increased vulnerability and greater susceptibility to earthquake damage, including: building configuration, the structural system and construction materials, location, construction and inspection practices, falling hazards, and inadequate exit pathways. While some of these factors will also be seen in construction within other sectors, it is important to consider the reconstruction process of schools, to address these specific vulnerabilities and how they are amplified or exacerbated within school construction. Schools are given an increased importance value within the Nepal Building Code (Government of Nepal, 1994), as they are occupied by a vulnerable portion of the population and have a post-disaster function. It is therefore important to ensure that schools can be reconstructed using appropriate seismic resistant technologies and materials, to provide safe education for children in Nepal, and performing the additional resilience and recovery roles mentioned.

The need to reconstruct using seismic resistant features is important within the context of adopting a 'Build Back Better' (BBB) approach, as specified in the Sendai Framework (UNISDR, 2015). Takahashi et al. (2015) also highlight the particular role that schools play in BBB and increasing community resilience, emphasising the potential for schools to bridge the gap between national and local level, and acting as a means to disseminate disaster risk reduction awareness and practices into communities.

In response to the 2015 Gorkha earthquake, the Government of Nepal (2017) produced a catalogue of approved materials and designs for reconstruction. Evidence of this range of technologies is also detailed through the work of various organisations involved in reconstruction and retrofitting efforts in Nepal (Bothara, et al., 2002; Macabuag, et al., 2012; Dixit, et al., 2014; Geiger & Zemskova, 2015; Rotary International District 3292, 2015). These include traditional construction using steel and concrete, as well as alternative materials such as earth bricks, earth bags, timber, and bamboo. However, there is a lack of evidence of the widespread use of these technologies, particularly in rural areas, where there are challenges of ensuring building code implementation (Kandel, et al., 2008; Scott, et al., 2013). This highlights that while there are a number of technologies and materials available to reconstruct and build more resilient school infrastructure, the practicalities of delivering these effectively to ensure suitable seismic resistance is affected by a wide range of factors. These include access to quality materials, the location of the school, stakeholder involvement the skill of those constructing schools, and the suitability of the design. These challenges must be considered collectively, to best understand how they impact construction. This includes how perspectives of the challenges differ between different stakeholders and at different levels of involvement within projects; how challenges vary in different locations; and how challenges will affect the suitability of different materials and designs.

Fitzmaurice (2015) also identified that while completing individual projects is relatively easy, through developing links with communities, there is less awareness of ways to successively scale this to country-wide programmes. Nepal provides an interesting case to explore this further, having begun implementing school upgrade work prior to the 2015 earthquake, and now facing the large task of reconstruction. Previous retrofitting work and initial reconstruction efforts have been very slow, highlighting potential inefficiencies in the reconstruction process. Retrofitting options are being explored in greater detail within the SAFER project coordinated by researchers at the University of Bristol; in this scheme of work a range of technologies and materials are being tested for their effectiveness (Tsiavos, et al., 2020) (Cross, et al., 2019), as well as modelling hazards, risks and fragility (Gilder, et al., 2020) (Giordano, et al., 2020) (Giordano, et al., 2021) in order to identify where is best to prioritise resources to improve resilience. However, while this work provides a solid technical analysis of the existing vulnerabilities and available mitigation technologies, there is a current lack of understanding and research into their appropriateness and suitability for different schools in different locations and contexts and how to implement them most effectively is an ongoing concern.

Both of these factors suggest that while there is scope to successfully reconstruct schools following the 2015 Gorkha earthquake, there are many barriers to doing this effectively, with limited knowledge transfer of good practice between projects. This leads to materials and practices being used within projects that may not be the most appropriate or suitable for the specific contexts of individual schools, or across broader school reconstruction coordination efforts. Pandey, et al. (2020) highlight that recovery is also affected, and governed, by the interface and interactions between community, technical and governmental levels, with more work needed in Nepal to build capacity in these areas: to mobilise resources at local and central government; community capacity to absorb and retain new interventions within new knowledge, skills and construction practice; and for engineers to more effectively engage in the local context, and communicate the technical and legal aspects of designs. A report by the UK Department for International Development (Michaels, et al., 2019) also identified that there has been a lack of representation of some voices within reconstruction, including communities, local governments, engineers, and masons.

To fully address these gaps in knowledge in current research, it is therefore important to understand each of these different perspectives, at community, technical and governmental levels, to identify and understand the range of challenges that may arise within school reconstruction. These challenges may limit the potential for projects to effectively Build Back Better, improving the safety and functionality of school infrastructure. This research will work to collect experiences from the range of stakeholders involved in the school reconstruction process, in order to understand the suitability of different practices in different contexts, the challenges to successful implementation, and good practice for successful project delivery. Based on these experiences, a framework will be developed, providing systematic suggestions to improve project quality and delivery. This framework will therefore help to improve the currently limited knowledge transfer between different stakeholders and projects, so that lessons learnt can be implemented in ongoing and future reconstruction efforts.

1.1.1. Project aim and objectives

The aim of this PhD research is to:

'To develop a means to improve new and ongoing school rebuild efforts in Nepal, by collating emerging and existing construction practices and delivery mechanisms, understanding the relevant factors that make them successful or not and providing a framework for transferring knowledge between projects.'

This achieve this aim the research has been grouped into six objectives:

Objective 1 – Consider the broader context of the research, and the current situation, by understanding the effects to the built environment of the Gorkha earthquake and the subsequent rebuild process in Nepal.

Objective 2 – Understand and map pre-existing school building infrastructure in Nepal, and subsequent reconstruction practice.

Objective 3 – Identify feasible and suitable seismic resistant design options for schools in Nepal, that could be applied within ongoing reconstruction.

Objective 4 - Devise a programme of fieldwork, to understand stakeholder perspectives, backed up by personal observations, to determine specified and actual practice.

Objective 5 - Assessment/evaluation of findings to identify and systematically map the challenges and appropriate good practices within the reconstruction process, and the relevant contexts in which these are seen.

Objective 6 – Based on the research findings, devise a systematic framework to increase the currently limited knowledge transfer between stakeholders, and provide tailored guidance to improve the delivery of school upgrade programmes for a variety of location scenarios in Nepal.

1.1.2. Project scope

This research focusses on the reconstruction of public schools in Nepal, that were damaged or destroyed in the 2015 Gorkha earthquake. This will be considered through a range of stakeholder perspectives within the process, at micro-scale (exploring individual case-specific schools), and macro-scale (exploring high-level government and NGO involvement and processes across multiple schools and projects). Some consideration is given to urban school reconstruction; however, the research primarily focusses on rural reconstruction, to increase the value and impact of the research.

Four key areas will be considered: 1) the materials used within reconstruction; 2) the reconstruction process and stakeholder involvement; 3) challenges for reconstruction, and good practice to reduce these; and 4) links with other resilience efforts within communities. This research will not develop new technologies, or consider technologies from other regions, as these could face multiple barriers to introducing them and would be unlikely to be adopted. Instead, this research seeks to learn from successful practices already used in Nepal, demonstrating their applicability, and addressing the knowledge transfer gap in order to broaden their implementation.

The research findings will be used to produce a prototype framework, that could be used to guide the delivery of future school reconstruction projects, recommending appropriate good practices for a given project context. This will then be used to validate the findings and be a potential mechanism for disseminating these to stakeholders.

While the research focuses on public school reconstruction, some aspects of the findings (e.g., material suitability, stakeholder engagement, and project accessibility) will also be relevant and transferrable to other areas, including: private schools; construction elsewhere in Nepal; in other sectors such as housing; and in other countries with similar contexts.

1.2. Thesis chapter outline

This thesis has the following structure. Chapter 2 will detail the research context, outlining the damage caused by the earthquake, typical construction typologies of schools in Nepal, and previous programmes implemented to upgrade school infrastructure.

To conduct this study, it is important to understand the range of perspectives and experiences of the stakeholders involved and so a social science research approach has been employed to collect these narratives. Chapter 3 outlines a review of the literature of the different available research methods and their suitability for different elements of the research.

Chapter 4 details the methodology and results of the pilot study fieldwork visit, which provides insight for the research context, and identifies key areas for further investigation in the next research phase, in particular highlighting the specific areas where knowledge transfer is limited, and would benefit from greater understanding. This work is detailed in (Westoby, et al., 2019) and (Wilkinson, et al., 2020).

Based on the pilot study findings, a phase two fieldwork visit is conducted, to investigate these key areas of interest in greater detail. This will include understanding the contextual impacts of each of these factors being investigated, considering that Nepal's school reconstruction approach cannot be addressed with 'one-size-fits-all' approaches. Chapter 5 outlines the methodology used in this phase, as well as presenting the results and analysis of this data. This work is also discussed by the author in (Westoby, et al., 2021) (also provided in Appendix A) and (Wilkinson, et al., 2020).

Based on the findings of the phase two research, a prototype framework was produced, which collated the data and organized it into systematic guidance, offering tailored good practices for different contexts. This can therefore assist in increasing the currently limited knowledge transfer between stakeholders and addressing the current gaps within the school reconstruction process. Chapter 6 details the process of producing this framework, and the methodology and results of a validation exercise, to measure the accuracy and efficacy of the framework and research findings.

The key conclusions of the research, as well as highlighting potential areas for further work to develop the research will be outlined in Chapter 7.

Chapter 2:

School infrastructure in Nepal

Chapter 2. School Infrastructure in Nepal

2.1. Introduction

The previous chapter highlighted that that there are challenges to rebuilding school infrastructure that was damage by the 2015 Gorkha earthquake. Additionally, much of the existing school infrastructure across the rest of Nepal remains vulnerable, without sufficient seismic resistance. These challenges must be addressed holistically, understanding the range of perspectives within the process, in order to identify the most effective means to address these challenges.

To assist this process, it is necessary to understand the present state of school construction, including the current and potential construction typologies and materials used, along with previous school upgrade programmes that have been implemented, and the damage caused by the 2015 earthquake, indicating the extent of the reconstruction task. It is also important to consider the stakeholders involved in the reconstruction process, and how this reconstruction can fit into global 'Build Back Better' targets. In this chapter, the relevant literature relating to these areas are discussed, highlighting the broader context and existing knowledge and the gaps that this thesis will address.

2.2. Typical school construction

As part of the Global Program for Safer Schools, launched in 2014 (World Bank, n.d.), a Global Library of School Infrastructure (GLOSI) was produced, detailing the taxonomy of school construction typologies worldwide, along with the associated fragility and vulnerability information (World Bank, 2019). However, as well as this global data, it is important to understand the construction typologies specifically for schools within Nepal.

Prior to the earthquake, Vishokarma et al. (2012) estimated that approximately 60,000 public school buildings across Nepal lacked sufficient seismic resistance, highlighting the major vulnerabilities within the education sector. Mishara (2012) also highlighted that much of Nepal's school infrastructure, in both rural and urban parts of Nepal, are insufficient for earthquake and high wind loading, and lack suitable environments for teaching. Following the 2015 Gorkha earthquake, a structural integrity and damage assessment (SIDA) was conducted, creating a database of earthquake damage and contextual information for approximately 18,000 schools in earthquake-affected areas (World Bank, 2017). The SIDA has contributed to GLOSI, and also fed into research assessing and evaluating seismic vulnerability and fragility of Nepal's school infrastructure. These include work such as evaluating empirical seismic fragility models (Giordano, et al., 2021), seismic vulnerability assessment (Gautam, et al., 2020), and assessing the implications of construction typology on seismic vulnerability assessments (De Luca, et al., 2019). Gautam, et al. (2020) indicates that over 90% of Nepal's school infrastructure can be rated as moderately to very highly vulnerable.

Pandey, et al., (2017) also highlight that even for schools with earthquake resistant designs, there was high variability in how they performed during the 2015 Gorkha earthquakes, due to factors affecting the quality of construction. These studies demonstrate substantial vulnerabilities in existing school buildings and a need to improve school build quality. It is therefore important to identify how schools can be reconstructed using appropriate seismic resistant technologies and materials, to provide safe education for children in Nepal. This requires identifying and understanding specific vulnerabilities within school infrastructure, both due to historic construction practice, and school-specific design features.

2.2.1. Vulnerabilities in school construction

There is increasing recognition that within developing countries public school infrastructure is particularly at risk due to natural disasters (D'Ayala, et al., 2020). Both globally, and specifically in Nepal, it has been seen that aspects of school construction increase the vulnerability of structures, and these factors are complex, inter-related and are dependent on the context of the school (Rodgers, 2012). This means it is important to understand the intricacies of how these factors interlink and be able to apply a specific contextual approach to construction, considering social, political, and economic factors, to effectively mitigate these vulnerabilities.

Configuring buildings to improve teaching spaces can increase vulnerabilities, for example requiring long, unsupported spans and walls without internal columns or walls, as well as large windows for natural light (Rodgers, 2012). Additionally, the structural system and construction materials used also introduce and exacerbate vulnerabilities, through the use of traditional, vernacular construction and poor-quality materials; this can be due to the availability of quality materials, low-skilled labour, and a lack of seismic-resistant design features within the construction (Rodgers, 2012). Paci-Green, et al., (2020) also highlighted that while standardised designs produced, for example by the Ministry of Education, can be suitable for specific contexts within a country, accounting for hazards, and availability of skills, these may not be appropriate across other parts of the country; this emphasises the need for a more locally-appropriate solution for school construction, taking into account the range of influencing factors in design.

As well as the structural design, school vulnerability can be affected by the location, with schools commonly situated on poor-quality land, which is exposed to a range of hazards, such as landslides, liquefaction, amplified ground acceleration and lateral spreading (Rodgers, 2012). This may arise due to limited land availability, particularly of suitable sites, and involvement of community in site selection, who can offer good local knowledge of frequent and common hazard events (such as seasonal flooding) but may be unaware of larger magnitude events causing greater damage (such as earthquakes) (Paci-Green, et al., 2020).

Lastly, vulnerabilities can arise due to issues with construction and inspection practice, in relation to a lack of skilled labour, insufficient checking processes, and corruption, which all affect quality of construction (Rodgers, 2012). This can be exacerbated within community-based school construction without sufficient technical support and expertise, and a lack of planning within the process (Paci-Green, et al., 2020). Wilkinson, et al. (2019), and De Luca, et al. (2019), also highlight the practice of constructing incrementally, adding additional storeys to existing structures, which perform poorly due to poor connection details and changes in construction materials. This makes it difficult to accurately categorise building typology and therefore accurately assess vulnerability, and highlights the importance of ensuring there is an adequate approvals and checking process in place, both in the short- and long-term, to limit uncontrolled, unsafe construction practices occurring.

These structural vulnerabilities are also affected by the choice of materials used within construction. The structural typologies for schools vary across Nepal, based upon the timeframe in which they were constructed, and the location and accessibility of the school, particularly in relation to urban versus rural locations (Wilkinson, et al., 2019). While some structural systems offer better seismic resistance than others, Adhikari & Gautam (2019) indicate that all are vulnerable even in minor earthquakes, estimating that all forms of school construction would suffer damage even when experiencing shaking as low as 0.05g peak ground acceleration (PGA). To attempt to reduce school vulnerability, following the 2015 Gorkha earthquake, the Nepal government has produced a set of standard school designs, with a range of recommended materials that can be used, which are shown in Figure 2-1. It is important to identify the typical construction practice prior to the earthquake, and how this varied by location, in order to understand the impact this had upon levels of school damage. This will also provide insight into the constraints and limitations that affect the suitability the different recommended materials for different regions within reconstruction efforts.

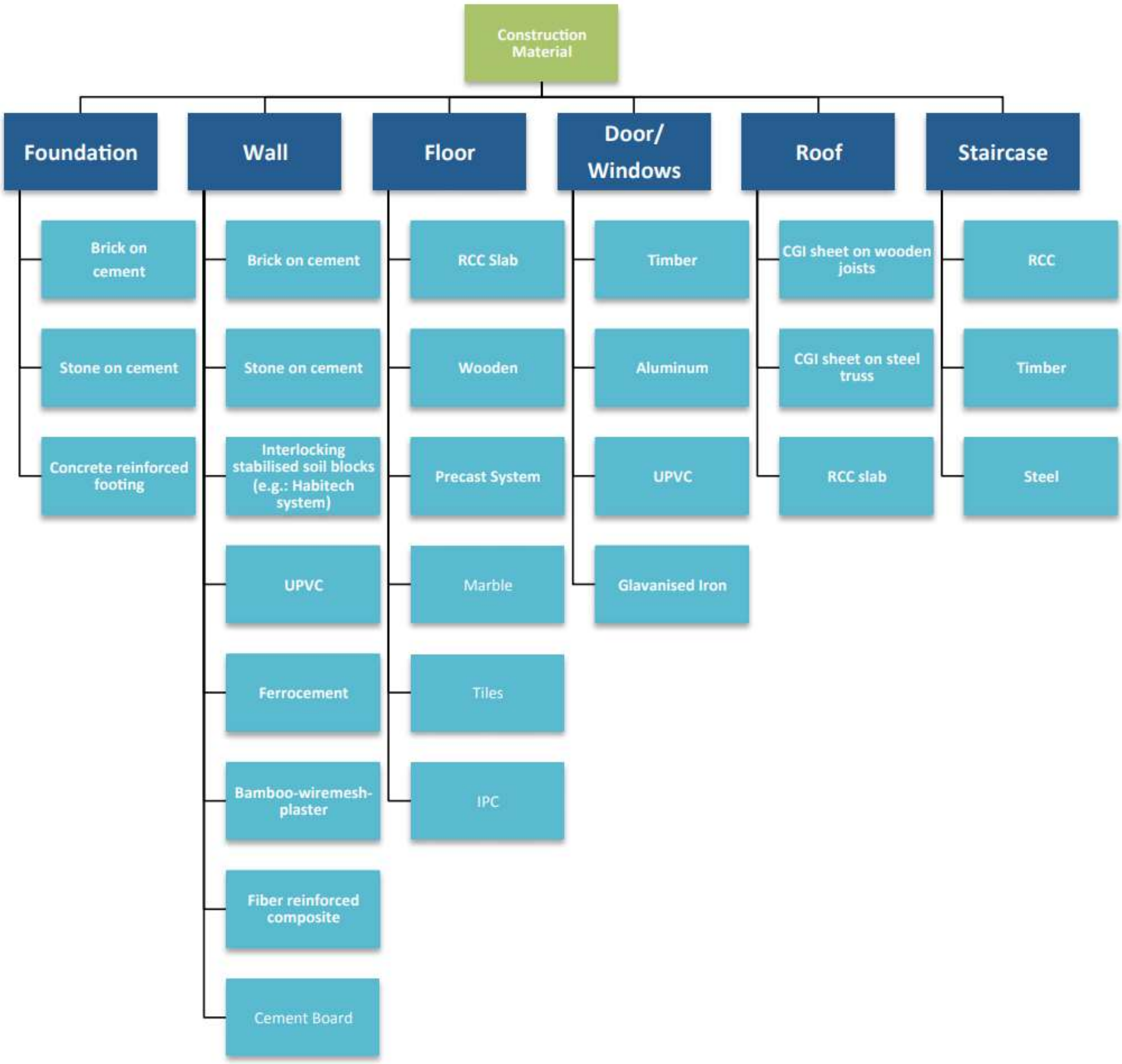

Figure 2-1 - Outline of recommended construction materials within type designs for school reconstruction in Nepal. Source: (ADB, 2016)

2.2.2. Typical urban school construction

Prior to the earthquake, it was estimated that within Kathmandu Valley, 30% of schools were constructed using reinforced concrete (RC) frames, while 65% used brick unreinforced masonry construction (URM) (Anwar, 2014). There had been a shift seen in the proportion of school construction in the different materials, with concrete and fired clay bricks becoming more prevalent in urban areas over time due to the increase in urbanisation (Wilkinson, et al., 2019; De Luca, et al., 2019). It is also likely that the shift in materials will continue in light of school reconstruction efforts adopting modern construction techniques, for example the increase in use of steel frame construction which is included within the government provided standard designs (DOE, 2016), and recommended construction materials (ADB, 2016), as shown in Figure 2-1.

De Luca, et al., (2019) provide an overview of typical construction typologies within Nepal, with a focus on housing, although these practices can also be identified within schools. Brick URM construction in urban areas typically uses cement mortar to bind masonry blocks, with a wall thickness of one layer of brick, with RC slab flooring, on strip foundation made of brick-cement masonry (De Luca, et al., 2019). This construction often does not meet building code regulations, and there is also an absence of vertical and horizontal bands, ring beams and adequate wall-to-wall and wall-to-floor connections, although concrete slab flooring can increase dynamic box behaviour. which can lead to in-plane damage in the form of diagonal cracks, bed joint sliding and in-plane rocking (De Luca, et al., 2019). In older urban construction, brick URM using mud mortar is also seen, with a lack of through stones, and wall-to-wall and wall-to-floor connections, along with flooring constructed using a mud layer on timber or bamboo joists, RC brick-concrete floors or concrete slabs; in this construction, out-of-plane failure is common, and is mostly seen in non-loadbearing and gable walls.

RC construction is increasing in popularity, and allows for larger, taller structures to be built, and examples of both non-engineered (with no technical input during construction), and engineered construction of this type (De Luca, et al., 2019). For non-engineered structures it is typical to see inadequate load paths from upper storeys, and between beams and columns, little redundancy in the structure, inadequate reinforcing details, and low quality concrete, which can lead to damage caused by soft-storey collapse (De Luca, et al., 2019). For engineered structures, reinforcing details are typically better, with a regular frame plan and layout, although it was highlighted that the Nepal Building Code does not provide the same level of ductility as other seismic codes such as Eurocode 8; in this form of construction, failure is typically governed by masonry infill wall causing brittle failure for flexural-shear interaction (De Luca, et al., 2019).

2.2.3. Typical rural school construction

While RC and fired clay brick use has increased within urban areas, this is still predominantly unfeasible within rural construction, instead using stone rubble with mud mortar, or adobe, although there is some more widespread use of fired clay masonry (Wilkinson, et al., 2019).

Rural construction, namely construction outside of Kathmandu Valley, is split into three regions: plain areas (Terai region), where brick masonry is common, in approximately 85% of construction, and 10% is in RC framed structures; hill regions, in which 10% was brick URM, and 87% of construction is classed as 'other' (including stone masonry, adobe, wood or mixed-system structures); and mountain regions, in which 97% of construction is categorised as 'other' (Anwar, 2014). While there is evidence that urban construction is vulnerable to earthquakes, rural school construction has greater vulnerability, particularly where stone masonry is prevalent (Adhikari & Gautam, 2019).

URM in rural areas is typically seen to be either brick masonry with mud mortar, or stone masonry in either cement or mud mortar, all of which were seen to lack adequate wall-to-wall and wall-to-floor connections, and limited use of through stones to tie walls together (De Luca, et al., 2019). For URM construction, out-of-plane failure of weak or poorly connected perimeter walls is common, leading to partial or full collapse (Giordano, et al., 2020). However, this is more commonly seen in URM with mud mortar, while cement mortar construction (in which RC floors can be found) improves wall and floor connections, so in-plane damage is more frequent (in the form of cracking, bed joint sliding and in-plane rocking) (De Luca, et al., 2019).

As well as brick and stone masonry, a newer approach, using interlocking earth bricks (often referred to as compressed stabilised earth bricks (CSEB), or interlocking stabilised soil blocks (ISSB) is used in some school reconstruction projects within Nepal, and is included within recommended type designs, as shown in Figure 2-1 (ADB, 2016). The design criteria list bearing, axial compression, in-plane flexural and shear, and out-of-plane flexural failure mechanisms for this construction type (ADB, and JICA, 2016). However, experiments conducted by Ali & Ahmad (2019) show that CSEB blocks provided comparable compressive strength as other masonry units, and the interlocking brick system was capable of resisting medium-high levels of shaking without triggering unstable failure modes, except for some light damage. This can therefore provide a suitable construction typology for rural Nepal, although it is imperative that reinforced concrete bands and vertical reinforcement at openings is used within designs, as these provide much of the resisting mechanism (Ali & Ahmad, 2019).

Adobe construction, most commonly seen in Terai construction, features sun-dried bricks in mud mortar, with flooring of a mud layer on wooden planks and timber or bamboo joists, and typically lacks wall-to-wall and wall-to-floor connections (De Luca, et al., 2019). In this construction, corner cracking is common, as well as delamination and detachment of walls, and out-of-plane failure (De Luca, et al., 2019). While this has been used within historic school construction, this is not included as a recommended construction material for schools following the 2015 (ADB, 2016), and should therefore be avoided within reconstruction efforts.

Metallic structures are also found in rural areas, typically only one storey and constructed between 1992 and 1997 as part of reconstruction efforts following the 1988 earthquake, and consist of a light-gauge steel frame, with infill walls constructed from stone or brick with mud or cement mortar, depending on the availability of materials locally (De Luca, et al., 2019). Walls are not connected to the frame, and the use of lintel bands connecting the walls and roof is uncommon; while structures are light-weight which limits severe damage, out-of-plane failure of walls occurs (De Luca, et al., 2019).

There has also been research conducted into new low-cost methods and technologies for improving seismic resistance of buildings, including a seismic isolation using a deformable granular layer (Tsiavos, et al., 2019), lead rubber bearings and friction pendulum isolation systems (Cross, et al., 2019), and a PVC 'sand-wich' isolation system (Tsiavos, et al., 2020). While these methods show promise, they are still being investigated on larger scales before they can be introduced in mainstream school reconstruction efforts; however, these should be considered within future work, as this research develops.

2.3. School upgrade efforts

2.3.1. Previous school improvement work in Nepal

Based on these construction typologies (both historic and more recent), much of Nepal's infrastructure was highly vulnerable to earthquakes. This was evidenced within the 1988 Udaypur earthquake, in which more than 66,000 buildings were damaged or destroyed (Bothara, et al., 2018). This highlighted the school vulnerability and led to an increased, and renewed, awareness of earthquakes and the importance of seismic design. Therefore, following this, efforts were made to improve resilience across all sectors: the Nepal National Building Code was introduced in 1994 (Government of Nepal, 1994), and the Kathmandu Valley Earthquake Risk Management Project was started (Dixit, et al., 2000). Damage to 6000 schools (Dixit, et al., 2014) lead to the implementation of the School Earthquake Safety Programme (SESP) by the National Society for Earthquake Technology (NSET), within six districts, three in Kathmandu Valley, and three in more rural parts of Nepal (Dixit, et al., 2014). The School Earthquake Safety Programme was implemented in 1997, with the aim to assess the vulnerability Nepal's school infrastructure and implement retrofitting and disaster resilience programmes at schools within Kathmandu Valley (NSET, 2000). An assessment of 700 public school buildings within Kathmandu Valley highlighted that only four to five percent had any seismic resistant design features, and only three buildings would have met the requirements outlined in the then draft Nepal National Building Code (Kandel, et al., 2004).

The first school to be retrofitted was completed in 1998, and progress continued at a rate of approximately 3 per year (Dixit, et al., 2015). In 2010, Nepal's Ministry of Education institutionalised the SESP, providing additional funding and support, and progress increased, with approximately 200 schools retrofitted from 2010 until the earthquake in 2015, totalling approximately 300 across the 17 years of the programme (Dixit, et al., 2015). While the achievements of the SESP are positive, initial earthquake risk management efforts in Nepal have highlighted a lack of capacity and technical experience, and a lack of appropriate local knowledge (Dixit, et al., 2013). Much of the literature around the SESP focusses on the achievements within Kathmandu Valley, and Anwar (2014) report that the retrofitting efforts were only administered in Kathmandu Valley. While the number of schools is much higher within Kathmandu, it is important that rural schools are still covered in upgrade work, providing safe school infrastructure for all children across Nepal. Additionally, it has been seen that retrofitting efforts are very limited, accounting for less than 0.3% of all school infrastructure in Nepal (Anwar, 2014), and these have been scattered, with a lack of coordination, meaning that very few schools received support, and leaving many schools behind and still at risk (Mishara, 2012).

Fitzmaurice (2015) highlights a range of school retrofitting efforts that have been conducted, and there is also evidence of other upgrade work conducted prior to the 2015 earthquake, including 11 schools retrofitted within Plan International's Safe Schools project (Bryneson, 2015), and 45 schools reconstructed or retrofitted in Taplejung by the Nepal Red Cross Society following the 2011 earthquake (Gautam, 2014).

Retrofitting efforts could be considered successful, with all 160 government retrofitted schools performing well in the earthquake (National Planning Commission - Nepal, 2015), aside from one school which was reported to have suffered damage due to failure of the foundations (Wilkinson, et al., 2019). It was also seen that many retrofitted schools were being used for shelter for families whose homes were damaged (Dixit, et al., 2015). It is important to note that the majority of these schools were located within Kathmandu Valley, where, due to ground composition of soft-surface deposits, the ground shaking experienced was lower than estimated peak ground accelerations calculated within recent seismic hazard analysis (Goda, et al., 2015). Paci-Green & Pandey (2016) also highlight retrofitted schools outside of Kathmandu Valley, for instance in Rasuwa and Sindhupalchowk districts, which also performed well, when non-retrofitted buildings on the same site and in the vicinity suffered damage; however, they also identify retrofitted schools that collapsed, for example in Rasuwa, due to poor-quality construction, lack of community engagement, and lack of technical oversight.

Much of the retrofitting efforts (and reconstruction following the earthquake) has employed a community-based construction approach, which offers greater potential for a sense of community ownership and broader adoption of new technologies, but can decrease quality of construction (Paci-Green & Pandey, 2016). To support construction, guidelines were also published outlining considerations and features that should be included within school design, not just to improve safety and seismic resilience, but also the quality of the space provided (Mishara, 2012), which included: structural aspects (e.g., stipulating spacing and quantity of reinforcement, and number of columns for different building scales); design features (e.g., well-lit and well-ventilated, ramps to improve access); and other facilities and fittings (e.g., separate, single-gendered toilet and handwashing, desk style and arrangement to improve evacuation). Alongside other school upgrade works, the School Sector Reform Plan (SSRP) was introduced, across 2009 to 2015, as a Ministry of Education project coordinating the majority of school improvements and modifications; it was seen that district level programs within this were being implemented satisfactorily and the SSRP could provide a suitable platform to integrate and scale up SESP and disaster reduction initiatives (Anwar, 2014).

2.4. Earthquake damage to school infrastructure

Despite the retrofitting efforts, high levels of school damage were also seen during the 2015 earthquake series, (such as that shown in Figure 2-2), with $300-$400 million damage and losses within the education sector, in which 25,134 classrooms were destroyed and 22,097 damaged across 8,242 public schools (National Planning Commission, 2015b). The earthquakes led to 9,000 fatalities and a further 22,000 injuries; however, as the 25 April earthquake occurred on a Saturday, while schools were closed, (and many schools had not reopened by the May 12 earthquake) no lives were lost in damaged school infrastructure (Molden, et al., 2016; Wilkinson, et al., 2019). If an earthquake of a similar magnitude were to have occurred during school hours, there would have been a much larger loss of life.

De Luca, et al., (2019) reported that within post-earthquake surveys, 6,000 school buildings were categorised with a damage grade of four or five, indicating very heavy damage or collapse, while 11,000 were graded as a two or three, indicating moderate to heavy damage. Levels of destruction were also seen to be greater in the rural areas close to the epicentre of the earthquake, with 99% of schools in Sindhupalchowk suffering damage, and 85% of classrooms in Gorkha being destroyed (De Luca, et al., 2019).

As indicated within the range of construction typologies, there are variances in the damage and failure modes seen. De Luca, et al., (2019) record the following failure mechanisms seen within the 2015 Gorkha earthquake: 1) corner cracks, 2) diagonal cracks, 3) out-of-plane failure, 4) top-storey collapse, 5) gable failure, 6) multi-leaf failure (e.g., delamination), 7) RC joint damage, 8) RC infill damage, and 9) soft-storey collapse. Many of these were also highlighted during reconnaissance surveys of schools by Wilkinson, et al., (2019), conducted after the earthquake, as discussed below:

- for RC frame schools with fired clay infill, four of the six schools visited had been red-tagged, with five showing little evidence of seismic design, and suffered varying degrees of cracking and collapse of non-structural infill walls, and at one four-storey school, there was severe damage to beam/column joints and the base of columns, as well as cracking of masonry walls.
- for fired clay masonry schools, five of the ten schools were red-tagged. There was evidence of seismic features, including sill level RC bands, and lightweight CGI gable walls, but there were no ring beams at the top of walls, creating unrestrained

cantilevers and cracking along the masonry-RC band joint, as well as insufficient bonding at corners causing gable wall collapse.

- all of the load bearing stone rubble masonry schools visited had been red-tagged, highlighting this as an inherently vulnerable construction typology. Stone rubble with mud mortar was common, meaning walls have very low strength, suffered from significant cracking, and as with fired clay masonry schools, there was a lack of ring beams around the top of walls causing gable wall collapse and damage to buttresses.

2.5. School reconstruction process

This damage to school infrastructure created a huge demand for reconstruction, with an estimated cost of $400 million (National Planning Commission - Nepal, 2015), and left millions of children without access to education in the short-term. Many schools closed for several months following the 2015 Gorkha earthquake, and safe school buildings were often used as temporary shelter for those whose homes were damaged (Molden, et al., 2016), as well as acting as centres for aid distribution within communities (Wilkinson, et al., 2019). Nepal has previously struggled with low education and literacy rates, but in recent years had made major progress improving this situation, increasing primary level enrolment from 64 to 96 percent since 1990 (USAID, 2019). Therefore, it was important to ensure minimal disruption to schooling, in order to maintain access to education for students, and reduce the number

Figure 2-2 - A school in rural Sindhupalchowk, damaged by the 2015 Gorkha earthquake of students dropping out of school during the long process of recovery for schools following the 2015 Gorkha earthquake. This recovery comes through several phases, to provide temporary learning facilities in the short term, allowing immediate access to education, and permanent reconstruction in the long term, to provide suitable, safe educational facilities.

To effectively implement and prioritise recovery efforts, it was important to understand the scale of the challenge and identify areas and schools most in need of support. To do this, the World Bank conducted a Structural Integrity and Damage Assessment (SIDA) (Adhikari, et al., 2016), assessing the level of damage at all public schools in the affected districts; this identified the construction typology, level of damage caused, and details about the size, location and requirements of the school. As well as conducting the SIDA, immediately following the earthquake, schools which had been damaged received Child Friendly Spaces (CFSs). These are designed to be delivered rapidly after a disaster, to provide safe spaces for children to meet, play and process the trauma, as well as providing childcare, allowing families to begin to re-establish homes and livelihoods (Snider & Ager, 2018).

CFSs cannot provide an adequate long-term learning environment, so Temporary Learning Centres (TLCs) were used to provide a longer-term solution. They are constructed using locally available materials such as bamboo, wood, steel sheets or tarpaulin (GPE Secretariat, 2015), such as those shown in Figure 2-3 and Figure 2-4. TLCs are only designed to last six months, acting as temporary classrooms until a permanent structure can be built, as they do not provide an adequate long-term learning environment (Niroula, 2019). A lack of sufficient weatherproofing for Nepal’s climate also made them unsuitable for long periods of the year. This is particularly the case for a country like Nepal as TLCs provide little weather-proofing to cope with the extremes in weather and climate faced, including monsoon rains, very hot summers in the terai region, and very cold winters in mountainous areas (Discover Nepal, n.d.). Since the earthquake, 3576 Temporary Learning Centres (TLCs) have been constructed, allowing most children to return to school (Fievet, et al., 2016). TLCs play an important role in aiding recovery, however, they should only be used a temporary measure. It should also be noted that within reconnaissance surveys, there were examples of damaged, unsafe buildings still being used for teaching, with school staff reporting that this was due to a lack of available space to provide alternative teaching spaces (Wilkinson, et al., 2019); this is something that should be considered in future earthquake events, to ensure that all schools have access to safe temporary teaching facilities while awaiting permanent construction.

As Figure 2-5 shows, even several years after the earthquake, many schools still had not received permanent structures. For some schools that had not been assigned for permanent reconstruction, Transitional Learning Centres, with a design life of three to five years, were used to bridge the gap between unsuitable temporary facilities and a permanent structure. In 2016, UNICEF began work to construct 650 Transitional Learning Centres at those schools that had not yet been assigned for permanent reconstruction, as schools were still relying on TLCs which were inadequate for this long-term use (UNICEF, 2018). These transitional structures are constructed using a steel frame, bamboo walls with a cement plaster and a steel roof, and have a design life of five years, and provide a more suitable learning environment (Niroula, 2019).

Figure 2-3 - Temporary Learning Centre, at a school visited during the pilot study field visit, constructed on the original foundation using CGI sheeting for both walls and roof.

Figure 2-4 - Temporary Learning Centre, at a school visited during the pilot study field visit, constructed on the original foundations using bamboo and CGI sheeting for the roof.

As of November 2020, 6,058 school buildings had been reconstructed (80 percent), with an additional 1468 (19 percent) under construction, all in line with BBB principals (National Reconstruction Authority, 2020c), but there are still many reports of schools not yet constructed, or facilities provided not meeting the needs of the schools (Karki, 2020). However, it should be noted that the progress of school reconstruction is more advanced than in other sectors, with 70% of houses, 59% of health facilities, and 50% of heritage sites fully reconstructed (National Reconstruction Authority, 2020c). Schools can therefore offer lessons in how to approach reconstruction activities.

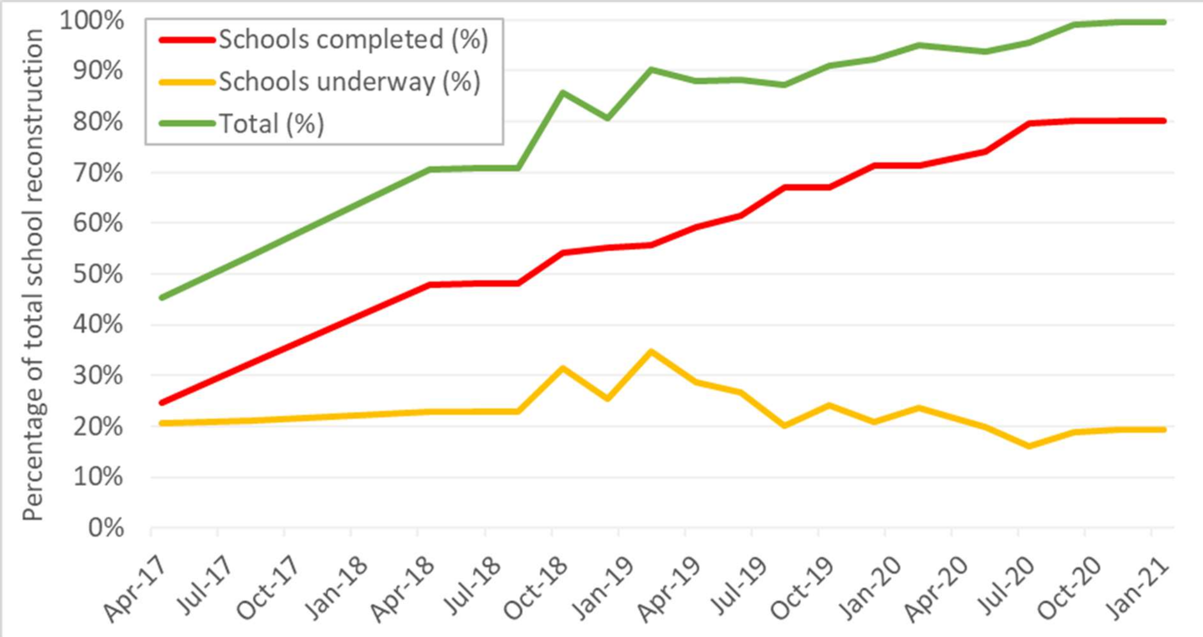

Figure 2-5 - Progress of school reconstruction in Nepal following the 2015 Gorkha earthquake, from April 2017 to February 2020, shown as schools completed, schools underway, and the total (out of the 7,553 target schools to be reconstructed) Source: (National Reconstruction Authority, 2021)

2.5.1. Stakeholder involvement

Prior to the earthquake, disaster risk reduction efforts in public schools were overseen by Nepal's Department of Education (DOE), working closely with District Education Offices (DEOs) supported by the Department for Urban Development and Building Construction (DUDBC) and Ministry of Urban Development (MOUD), with most of the construction work carried out by communities and Village Development Committees (VDCs), or by I/NGOs (Anwar, 2014).

However, following the immediate aftermath and initial recovery phase of the 2015 Gorkha earthquake, the focus moved towards reconstruction of permanent structures. The National Reconstruction Authority (NRA) was established in December 2015, to oversee reconstruction in all sectors across Nepal (NRA, 2016). An overview of the organisational structure is shown in Figure 2-6, with education falling under the Public Buildings Division.

The process of reconstructing Nepal's schools is highly complex, with many different stakeholders involved across different levels. Central Level Project Implementation Units (CLPIUs) were established for four sectors, including education (CLPIU-Education), to implement the reconstruction efforts (NRA, 2016). The CLPIU-Education was established to support the NRA and coordinate the delivery of school reconstruction (CLPIU-Education, 2016). They are responsible for allocating and approving projects, ensuring that designs adhere to the Nepal National Building Code. The CLPIU-Education is supported District Level Project Implementation Units (DLPIUs), established in the 20 most affected districts, to provide local level oversight, technical support and conduct checks to ensure that construction is in line with the design (CLPIU-Education, 2016).

Work to reconstruct schools is undertaken by a variety of organisations, including the CLPIU (Education), aid agencies, and local and international non-governmental organisations (NGOs) (Briggs, 2018). This work is categorised into three modes of implementation: 1) through a community managed approach coordinated by School Management Committees (SMCs); 2) though a tendering process with professional contractors; and 3) through I/NGOs who may adopt either implementation mechanism (Carter, 2020). There is some variation in reports of the distribution of these modes; Carter (2020) reported a 75%, 10%, 15% split respectively) whereas latest figures published by CLPIU-Education (2020) (at the time of writing) suggest this is closer to 82%, nine percent and eight percent for SMC, contractor and I/NGO respectively. While this has the benefit of providing a locally appropriate response, with the majority of construction overseen by SMCs, they also have very limited, or no, experience of managing construction projects, and this limits the potential for knowledge transfer between organisations, when individual schools are responsible for overseeing their own construction. This reduces the ability to share good practice between stakeholders and therefore broaden its implementation. Additionally, these three stakeholders must work in conjunction with many other stakeholders, who each have a role to play in delivering school reconstruction projects, including the schools and communities, engineers, architects, masons and labourers, volunteers, lawyers, CLPIU-Education and local DLPIU offices. This creates a very complex network of involvement, and requires the consideration of many different perspectives within the process, in order to work most effectively.

To complete all reconstruction, the total funds required for recovery within the education sector has been estimated as 180,628 million NPR (1,806 million USD), accounting for 22% of total reconstruction costs, and second only to the funds required for rural housing recovery (286,060 million NPR / 2861 million USD) (National Reconstruction Authority, 2016). Within the three implementation modes for school reconstruction, there are different funding mechanisms to support school reconstruction, which may have implications on project scope, requirements and quality. Across all sectors, the National Reconstruction Fund channels all funds for reconstruction, with finance provided through either the Nepal government, or through donors (National Reconstruction Authority, 2016). Across several of Nepal's development partners, approximately 25% of the total work and finance is met, including: the Asian Development Bank (ADB) reconstructing 162 schools, the Japan International Cooperation Agency reconstructing 236 schools with $112 million, Government of India reconstructing 70 schools with $50 million, along with support from United States Agency for International Development, and the UK Department for International Development (ADB, 2018). Alongside this, funds have been provided by a range of I/NGOs, completing projects of different scales, including: 17 schools by World Vision International; 32 schools by Helvetas Swiss Intercooperation – Nepal, in collaboration with CARITAS Switzerland; 75 schools by United Mission to Nepal; 23 schools (176 classrooms) by Save The Children; and one school by Phase Nepal (NRA, 2017).

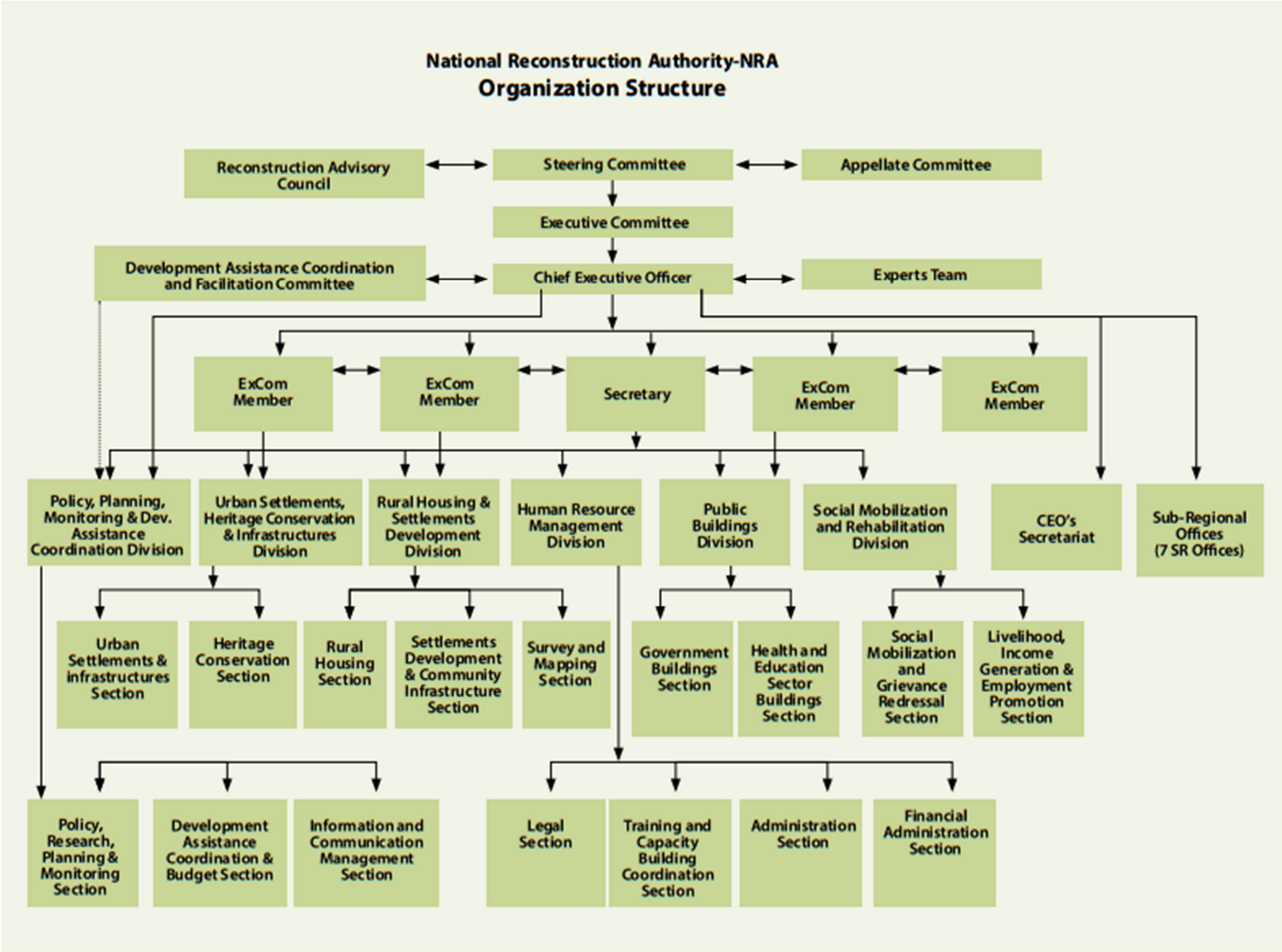

Figure 2-6 - Organisational structure of NRA. (Source: (NRA, 2016))

2.5.2. Concerns and challenges for reconstruction

As highlighted above, while much progress has been made, there is still much work to be done, to fully reconstruct the affected schools, and this reconstruction is affected by many challenges, which are still impeding progress and affecting quality. As well as the pressure to reconstruct schools damaged in the 2015 Gorkha earthquake, studies prior to the earthquake highlighted that construction of 45,000 new classrooms (36,000 within public schools) would be required by 2021 to meet the increased demand for schooling within Nepal (Anwar, 2014). This demonstrates the ongoing need for providing school construction in Nepal; it is important that this is not overlooked amid the pressure of earthquake reconstruction. This work will also face many of the same challenges as those experienced within reconstruction efforts, and more must be done to learn lessons from reconstruction, to improve delivery of these projects. Paci-Green, et al. (2020) also highlight that for many school construction projects, natural hazards are inadequately considered, indicating that even when constructed, there is a risk that buildings lack sufficient resistance to withstand these disaster events.

There have been challenges evidenced throughout the whole recovery process, from initial damage assessments to permanent reconstruction. Reconnaissance reports highlighted examples of overly cautious damage assessments for some schools, creating additional pressure and demand for providing temporary learning facilities (Wilkinson, et al., 2019). The location and accessibility of schools also impacted support; in some areas, ongoing landslides delayed relief and aid provision, and while schools in the vicinity of Kathmandu received army and agency support for demolition and provision of temporary facilities, rural areas were dependent on community-led involvement (Wilkinson, et al., 2019). This has also been seen within permanent reconstruction efforts, in which some areas where there was a lack of land, or where there was limited road access, found that reconstruction had not been possible (National Reconstruction Authority, 2020b). More needs to be done to identify appropriate solutions, to enable school reconstruction, even when facing multiple challenges.

Prior to the earthquake, progress within the SESP had highlighted several challenges to project delivery, including: insufficient capacity, resources and technological solutions; a lack of quality assurance and coordination between stakeholders; and a need for better financial management and consideration of community involvement (Anwar, 2014). There has been some research into Nepal's reconstruction, this has predominantly focused on technical aspects, retrofitting and geohazard assessments; however, little consideration has been given to integrated infrastructure reconstruction, reconstruction in specific project contexts (accounting for the impact of social, cultural and political factors), and long-term functioning of infrastructure (Michaels, et al., 2019). Bothara, et al. (2018) and Sharma, et al. (2018) have investigated challenges affecting housing reconstructing in Nepal, identifying a lack of coordination, governance and reconstruction infrastructure, accessibility, manpower shortage, knowledge gap, and socio-cultural issues, among others. He, et al. (2018) echo some of these findings, also highlighting that existing vulnerabilities and disadvantages can add pressure which can lead to hasty and therefore ineffective reconstruction. However, these works give little consideration to the education sector. Given the importance of school infrastructure, and the differences in design, project delivery mechanisms and stakeholder involvement, there is a need to identify school-specific reconstruction challenges, and practices to address these, within the individual contexts and constraints they present.

In order to ensure hazard-resistant construction, this requires top-down, government-led adoption of building codes, and these must integrate up-to-date hazard profiles to be most effective (Paci-Green, et al., 2020). In order to achieve this, guidelines (ADB, 2016), and structural design criteria (ADB, and JICA, 2016) were created for the production of a range of type designs for school construction. These standard designs account for different material use, and cover a range of sizes (including a one storey, three classroom block (CLPIU (Education), 2017), two storey, four classroom block (CLPIU (Education), 2018), and a four storey, seven classroom block (CLPIU (Education), 2018)). However, it is possible that some of these designs have been adopted from designs used in other regions, and may not give consideration to the suitability, material deterioration, and functionality, dependent on differences in context (e.g., climate) (Paci-Green, et al., 2020). As discussed in Section 2.2, there is a range of materials used within school construction in Nepal including traditional construction using steel and concrete, as well as alternative, locally available materials such as within earth bricks, earth bags, timber and bamboo. Local materials can offer disaster resilient structures for schools, but this is reliant on them being constructed according to the Nepal Building Code, making use of suitable resistant design features (ADB, 2016). However, it is expected that these measures may not be effectively addressed within many projects, given the prevalence of challenges within the reconstruction process, and a lack of understanding of the locations in which these materials are most suitable. This indicates a need to identify good practice to overcome and mitigate these challenges, and identify appropriate materials for different contexts, to improve the quality of construction.

However, there are also concerns over the safety of some materials (such as earth bags), and their use within ongoing school reconstruction efforts. For newer technologies (e.g., CSEB), their use is limited and may be regarded with mistrust over their suitability. There may also be a lack of awareness of locations where different materials are most suitable, affecting their deployment across Nepal. Wilkinson, et al. (2019) also identified that while prefabricated, bolted steel frames had been used from very early reconstruction efforts, offering lightweight, quick to build, structures, there had been little consideration of the location of the new buildings; this indicates broader concerns with the delivery of type designs, and their applicability and suitability within specific project contexts.

Fitzmaurice (2015) also identified that while completing individual projects can be relatively easy, through developing links with communities, there is less awareness of ways to successively scale this to country-wide programmes. Additionally, even prior to the earthquake, it was highlighted that there were insufficient consultants and contractors to conduct all the construction needed, and that international support would be required (Anwar, 2014); this indicates that there is a need for increasing capacity and resources (i.e., within local and central government institutions) to strengthen project coordination and delivery. Similarly, there is also a lack of skills and knowledge to effectively construct the designs, particularly when communities, and local unskilled labour are involved (Paci-Green, et al., 2020). This requires translating designs to be understandable at a local level, and expert involvement to supervise and monitor construction, but this is expensive, and often not included within project budgets (Paci-Green, et al., 2020). In addition to this, long-term maintenance of schools is often overlooked, and communities lack sufficient funds or knowledge to do this, which can be detrimental to the long-term safety of buildings (Paci-Green, et al., 2020). Identifying ways to integrate these into school reconstruction is important to ensure better long-term resilience and sustainability.

2.5.3. Trends from other earthquakes

As well as the damage seen in Nepal, schools around the globe have major vulnerabilities, and have also experienced high levels of damage during earthquake events (Rodgers, 2012). School vulnerability assessments have also highlighted the risks posed to schools, such as a study conducted in Tehran which found that less than 10% of schools could be classed as both structurally and geotechnically safe, and 597 out of 2125 schools could experience high levels of damage in a future earthquake event (Panahi, et al., 2014).

There are many factors influencing this high level of school damage, with construction lacking appropriate technology and enforcement of regulations (OECD, 2004). Following the 2009 Padang earthquake, assessment of damaged schools highlighted insufficient connection details and support to masonry walls, below what is specified in Indonesian building codes, possibly due to inadequate supervision during construction (Wilkinson, et al., 2012). A similar case was also witnessed in Haiti following the 2010 earthquake, in which there were discrepancies between the designs, in line with appropriate building standards, and the actual construction, with a lack of adequate seismic details included, possibly as a result of insufficient material quality control, and a lack of supervision to ensure that construction matched the design (Marshall, et al., 2011). The disproportionate school damage caused by the 2008 Sichuan earthquake was attributed to the lack of ductility and redundancy of structural members in the unreinforced masonry and non-ductile cast-in-place reinforced concrete frame construction typologies which were prevalent in school infrastructure (Miyamoto, et al., 2008). It has also been seen that despite high levels of damage, communities can be quick to rebuild in the same manner as before, re-introducing the same vulnerabilities. For example, a study in Indonesia highlighted a school being reconstructed using salvaged bricks from the previous structure, and extra very poor-quality bricks (Wilkinson, et al., 2012).

2.6. Disaster risk reduction and build back better

2.6.1. Disaster risk reduction frameworks

Having seen the extent of damage caused by natural disasters, and flaws within recovery efforts, in recent decades there has been an increased focus on disaster risk reduction (DRR) measures, to attempt to mitigate these issues. This began with the introduction of the International Decade for Natural Disaster Reduction (IDNDR) (1990-2000), within which the Yokohama Strategy (IDNDR, 1994) was produced; this provided the first international level set of guidelines aimed at disaster prevention, preparedness and mitigation (Tozier de la Poterie & Baudoin, 2015). The Yokohama Strategy accomplished many things, particularly expanding global understandings of the interlinking nature of poverty, sustainable development and managing resources and risks, as well as making some progress towards mainstreaming disaster risk reduction within national and international strategy (UN. Secretariat, 2004).

However, achievements were limited, lacking implementation, cooperation and progress reporting, with a number of gaps and challenges identified, including: governance; risk identification, assessment, monitoring and early warning; knowledge management and education; reducing underlying risk factors; and preparedness for effective response and recovery (UN. Secretariat, 2004).

These gaps form the five priority actions for the Hyogo Framework for Action (2005-2015) (UNISDR, 2005): 1) ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation; 2) identify, assess and monitor disaster risks and enhance early warning; 3) use knowledge, innovation and education to build a culture of safety and resilience at all levels; 4) reduce the underlying risk factors; and 5) strengthen disaster preparedness for effective response at all levels. These collectively work towards the aim of the Hyogo Framework for Action, for: “the substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries” (UNISDR, 2005). This framework was established in 2005, in the aftermath of the devastating 2004 Indian Ocean tsunami, and has been highlighted as the most significant step towards recognising disaster risk reduction at an international level (Tozier de la Poterie & Baudoin, 2015).

Alongside this, the concept of ‘Build Back Better’ (BBB), as part of disaster risk reduction efforts, was first introduced following the 2004 Indian Ocean tsunami. This set out propositions for using recovery and reconstruction efforts as an opportunity to improve resilience within communities, including the aim that “good recovery must leave communities safer by reducing risks and building resilience” (Clinton, 2006). While BBB offers a positive step in improving DRR efforts, it is important to acknowledge the ambiguity of ‘better’, which may refer to improved aesthetics or functionality, rather than reducing risk. Kennedy, et al. (2008) instead propose the use of ‘Build Back Safer’, while Platt, et al. (2020) highlight that BBB should also include a ‘Build Back Safer’ approach. Reconstruction efforts should therefore seek to not only ensure that infrastructure is constructed with adequate resistance and resilience for all potential hazards, but where feasible, and not to the detriment of safety, to also improve the functionality and broader impact of reconstruction and optimise the use of resources.

Following the end of the Hyogo Framework for Action, the Sendai Framework for Disaster Risk Reduction, was introduced, with the goal to: ‘Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience' (UNISDR, 2015). For the first time, this also incorporated BBB as a tool for disaster risk reduction and was included as one of the four priority areas for action: 'Enhancing disaster preparedness for effective response, and to Build Back Better in recovery, rehabilitation and reconstruction' (UNISDR, 2015). While these present positive steps forwards within international DRR efforts, there are concerns that the Hyogo, and Sendai Frameworks overlook, and demonstrate a shift away from, the importance of local context and engagement with local actors and expertise, which was prevalent in the Yokohama Strategy (Tozier de la Poterie & Baudoin, 2015).

2.6.2. Development goals

In the same timeframe as these international policies and guidelines, formed from the United Nations Millennium Declaration (UN, 2000), the Millennium Development Goals (MDGs) were introduced in 2000; these outlined eight targets for more sustainable development, which are crucial to reducing climate and environmental related hazards, in term improving DRR efforts (UN. Secretariat, 2004). The MDGs had a number of successes (including a reduction in those living in extreme poverty and without access to improved water sources), however, there were still gaps that needed addressing (including gaps between rich/poor, and rural/urban areas, and the consequences of climate change and environmental degradation) (UN, 2015). Additionally, there is evidence that the MDGs do not adequately involve developing countries within delivery, and that they are unachievable, simplistic and not adapted for individual country needs (Fehling, et al., 2013).

Following the end of the MDGs, the Sustainable Development Goals (SDGs) (also called Global Goals) were introduced in 2015, comprising of 17 goals to achieve sustainable development from 2015-2030 (UN, 2015). Conversely to the MDGs, the SDGs, in line with the Sendai Framework, have a clearer focus on disaster reduction and resilience, outlined in Goal 9: 'build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation', and Goal 11: 'make cities and human settlements inclusive, safe, resilient and sustainable' (UN, 2015). The SDGs also embrace an integrated approach, acknowledging that the goals do not exist in isolation, but are interlinked, with mutual benefits and impacts (UN, 2015). This is seen within goals nine and 11, in which achievements would contribute towards goals four (access to education), five (gender equality), six (water/sanitation), and ten (inequalities within and between countries); additionally, goals nine and 11 are also reliant upon other goals, e.g., goals 12 (sustainable resource consumption/production), 15 (protecting and sustainably managing ecosystems), and 16 (effective, accountable, inclusive institutions at all levels). It is therefore important to consider this broad range of factors when identifying practices to improve the delivery of reconstruction projects.

2.6.3. Disaster risk reduction within Nepal's school reconstruction

Nepal's school reconstruction efforts should work in conjunction with the targets established within the Sendai Framework and SDGs, incorporating BBB and 'build back safer' principles to improve the safety and resilience of school infrastructure. This is not something that was not implemented following the 1988 earthquake, so shows growth in Nepal's disaster recovery approach (Bothara, et al., 2018). Nepal's Post-Disaster Recovery Framework (National Reconstruction Authority, 2016) identifies that reconstruction should integrate DRR and BBB principles, highlighting four areas in which this can be achieved: 1) encouraging the use of local building materials; 2) addressing risk and vulnerability due to earthquakes and other hazards, incorporating safer designs and infrastructure specifications; 3) promoting safe multi-storey building construction within urban areas; and 4) implementing programmes to train engineers, supervisors, masons, and labourers.

Paci-Green & Pandey (2015) also recommend seven key principles for good practice for safer school construction, particularly incorporating a community-based approach: 1) 'build safer schools and strengthen weak ones'; 2) 'engage as partners'; 3) 'ensure technical oversight'; 4) 'build upon local knowledge'; 5) 'develop capacity and bolster livelihoods'; 6) 'support a culture of safety'; and 7) 'scale-up and promote accountability'. These should be used to guide Nepal's school reconstruction efforts, and inform the findings and outputs of this research.

As well as achieving the 'safer' aspects of a BBB approach, if carefully planned and considered, there is also the opportunity to maximise the wider benefits Nepal's school reconstruction efforts can offer. This can lead to community cohesion and ownership, schools advocating their needs, and higher occurrence of long-term monitoring and maintenance (Paci-Green, et al., 2020). Schools can also feature within broader disaster planning, with increased risk awareness, and can model safer construction practice aiding knowledge and technology transfer and increasing implementation of these within other infrastructure (Paci-Green, et al., 2020).

While the existing literature on reconstruction in Nepal identifies some overarching areas in which improvements are necessary to see positive change (e.g. (Bothara, et al., 2016) (Sharma, et al., 2018)), they do not address specific mechanisms through which these can be achieved, particularly across the diverse range of contexts present in Nepal. Introducing 'build back better' and 'safer' approaches is not straightforward and must be carefully considered and planned for (Paci-Green, et al., 2020). Without practical guidance to achieve this, there has been a failure to implement effective 'build back safer' approaches in Nepal (Platt, et al., 2020), as well as examples elsewhere, such as those following the 2009 L'Aquila earthquake (Imperiale & Vanclay, 2020). Identifying these practical actions and mechanisms requires learning lessons from those with experience of constructing in the relevant contexts, to ensure that these are effective and suitable within the challenges and constraints faced.

2.7. Conclusion

Globally, construction practice introduces seismic vulnerabilities for school infrastructure. In Nepal, this was highlighted in the 1988 earthquake, prompting the introduction of the SESP, aiming to assess, and retrofit vulnerable structures, and increase earthquake awareness. While retrofitting efforts were mostly effective, their impact was limited, with few schools reached, leaving many schools across Nepal at risk, with estimates that 90% of Nepal's schools is rated as moderately to highly vulnerable. This is due to unsuitable building materials and technologies, and poor construction practice. Historically, Nepal's schools are constructed using unreinforced masonry, random rubble, adobe, and steel or timber frames, while the use of reinforced concrete and fired bricks in urban areas and CSEB have become more prevalent in recent years.

Widespread destruction caused by the 2015 Gorkha earthquake, in which over 8,000 schools were damaged or destroyed adds to the need for effective reconstruction and school upgrade work, to improve the safety of Nepal's schools. This reconstruction requires the involvement of many stakeholders, within funding, project implementation and management, and project delivery. It is important to appreciate and acknowledge the range of perspectives this introduces, and the different areas of expertise and knowledge each can offer.

Research into housing reconstruction has highlighted challenges such as coordination, a skills gap, and accessibility. However, these works have not investigated the specific challenges affecting school reconstruction or identified specific practices that can be implemented to reduce these challenges. This is necessary to effectively build back better and safer to create school infrastructure that will be resilient in future earthquake events. This forms a goal of Nepal's Post-Disaster Recovery Framework, as well as working towards the UN SDGs and Sendai Framework targets.

To do this effectively, it is important to identify contextually appropriate solutions. This requires observing and gathering insights from stakeholders directly involved in Nepal's school reconstruction process, providing local perspectives and experience of delivering projects. The following chapter will evaluate the research methodologies that could be used to do this, considering: the specific approaches available; data collection and analysis methods; and the practicalities of implementing these.

Chapter 3:

Methodology literature review

Chapter 3. Methodology Literature Review

3.1. Introduction

As highlighted in Chapter 2, the 2015 Gorkha earthquake caused widespread damage to Nepal's schools, requiring an enormous task to reconstruct these. There is a range of structural engineering solutions, utilising different materials, seismic design features, and risk-reduction solutions. However, this knowledge (which would improve the quality and safety of schools) has not been effectively communicated to decision-makers and those investing in school infrastructure (World Bank, 2019).

Existing research has highlighted several challenges affecting reconstruction in general, but this has overlooked school reconstruction, including the impact of the mechanisms through which projects are delivered, and their specific contexts. Additionally, while some broad over-arching recommendations have been identified in other research, these typically do not provide specific actions that are tailored for different locations and contexts and are therefore not easily applied to individual projects. This research therefore seeks to gather insights from stakeholders directly involved in delivering school reconstruction projects in Nepal, providing in-depth experience and knowledge of the local context, challenges faced, and suitable good practice to reduce the challenges. This chapter will outline the approach of this research, along with a review of the available research methodologies that could be implemented, and the factors that must be considered when conducting the research.

3.2. Approach

To provide a full picture of the challenges and good practices within Nepal's school reconstruction efforts, it is important to understand these from the perspective of each of the different stakeholder groups involved in the process. This acknowledges that quality construction is multifaceted and complex, requiring interaction between many stakeholders of both technical and contextual backgrounds (Rossetto, et al., 2014). Being able to account for these different views in order to identify holistic solutions within a strong and flexible framework is a necessary part of successfully carrying implementing national disaster reduction efforts within school reconstruction (Anwar, 2014). Pink et al., (2010) within an ethnographic study of construction practice, also highlight the need for interventions and practice to be attendant to the specific contexts and mechanisms in which they are applied.

Therefore, this research will take an interdisciplinary, ethnographic approach, balancing technical structural engineering knowledge with social science research methodologies to gather these perspectives and learn from the experience of stakeholders directly involved in Nepal's school reconstruction process. As highlighted by Ragin & Amoroso (2011) this enables in-depth information about specific cases to be examined, ensuring that findings are locally appropriate for a given context, rather than just providing 'big-picture' generalisations which may not be applicable within most cases. Lune & Berg (2017) also highlight the opportunity this provides to reveal hidden elements that are otherwise not visible or well understood from the outside. Without this, there is a risk of missing out on identifying key factors and considerations that could provide contextual understanding on the ways in which school reconstruction projects are set up and delivered.

This approach has also been used within other research of this style, highlighting its suitability. Paci-Green, et al. (2020) used interviews and online surveys with expert stakeholders, within a global study of challenges and benefits within community-based school construction. A study by Sharma, et al. (2018) investigated the challenges affecting broader reconstruction across five districts in Nepal, through field observations and a series of interviews and focus groups with engineers, social mobilisers, local community members and political leaders, and experts. When investigating pre-existing vulnerabilities and their impact on recovery, He, et al. (2018) conducted a field study within one Village Development Committee (VDC) area, employing field and participant observations, alongside interviews with households and meetings/interviews with the VDC secretary, local leaders and district officials.

This research be conducted using field studies, underpinned by a 'grounded theory' research approach (Glaser & Strauss, 1967); through this, a reflective research process is adopted, in order to develop and hone research questions and themes identified across multiple phases of work (Agee, 2009). Within phase one of the research, a pilot study will be conducted, which will: broaden contextual understanding; identify key areas of importance to be investigated further; and provide the opportunity to hone research methods, identifying practices and styles that are most effective and suitable (Lune & Berg, 2017; Nunes, et al., 2010). The pilot study (detailed in Chapter 4) will aim to identify common challenges affecting school reconstruction in Nepal.

Phase two of the research (detailed in Chapter 5) aims to build on the findings of the pilot study, providing in-depth understanding the challenges identified, and good practice to overcome and mitigate these challenges, with greater contextual sensitivity (Nunes, et al., 2010). The research methods used in this phase will be informed by the insights gained in the pilot study, including within the means of data collection, question design, and the logistics of conducting this work.

Based on the analysis of the phase two results, a prototype framework will be developed and validated within phase three of this study (detailed in Chapter 6). This framework will collate the challenges and associated good practices with the contexts in which they are relevant, allowing users to identify locally appropriate solutions for a given school reconstruction project. While research methods in the earlier phases will be designed to increase the reliability and validity of data (Lune & Berg, 2017), this will be supported through conducting a validation exercise. In this, stakeholders involved in Nepal's school reconstruction process, will trial the framework and share their perceptions, which will be analysed to assess the accuracy of functionality of the logic within the framework.

D'Ayala, et al. (2020) also highlight the need for integrated 'ground-real' strategies for improving school safety and resilience; this indicates that solutions must be grounded in in-depth knowledge and experience of the contexts they are applied to. Across the three phases, this will be achieved through hearing perspectives of stakeholders directly involved in Nepal's school reconstruction efforts, at two different levels. Case-specific perspectives (from stakeholders involved with individual school reconstruction projects), will provide microscale insight into specific challenges and good practice for a specific project context. Alternatively, high-level perspectives (from stakeholders involved in broader school reconstruction delivery and coordination) will provide macroscale, 'top-down' insight of the mechanisms governing programmes (e.g., funding, implementation, and regulation), and the general applicability of challenges and good practice within the spectrum of project contexts. Both of these perspectives provide valuable insight into the school reconstruction process, and by examining and comparing both, discrepancies between experiences and perspectives at the two levels can be identified, suggesting areas in which there may be miscommunication between different project stakeholders, or aspects of projects that are underappreciated at either the case-specific or high-level scale.

3.3. Social science research methodologies

There are a range of methodologies that can be used to conduct research of this nature. These include both qualitative and quantitative approaches, and those using a mix of several methods. Each offer different benefits and limitations; however, no one method is inherently better than another, but instead their suitability and value is related to the specific research purpose and questions (Arksey & Knight, 1999). The suitability and applicability of each of these methods for this study are detailed in the subsequent sections, and the chosen methods for each phase are detailed more fully in Chapters 4, 5 and 6.

3.3.1. Questionnaires

Questionnaires (or surveys) use a format of a rigid set of questions, asked in the same manner to all participants (Smith, et al., 2009; Marshall, 2005). They are also distinguished by being designed for participants to complete them without any direct interaction with the researcher (Rowley, 2014). These typically provide quantitative data, with common closed questions including asking participants to select or identify specific items or factors, rate or order criteria, or provide short-form responses to questions (Smith, et al., 2009; Marshall, 2005; Rowley, 2014). When sample size and selection is a good representation of a broader population, it is possible to identify general trends and patterns in responses, which can be generalised to other samples or situations (Marshall, 2005; Rowley, 2014). However, questionnaires, can limit the amount of qualitative data than can be collected to give greater in-depth understanding of the reasons for these responses (Marshall, 2005; Rowley, 2014). Open questions (such as asking participants for any further comments, or to outline reasons for an earlier answer), can be used to give greater in-depth understanding of a few key areas, or corroborate answers to closed questions (Marshall, 2005; O'Cathain & Thomas, 2004). When using open questions, in order to be effective, these must be placed strategically, considering the purpose of asking these questions, and how they will be analysed (either quantitatively or qualitatively) (O'Cathain & Thomas, 2004; Rowley, 2014).

Questionnaires are typically produced in written form (using a pre-formatted document, or online platform) (Marshall, 2005; Denscombe, 2006). Work by Denscombe (2006) also indicates that there is little variation in the content and rate of response between these two formats. Written formats offer a level of anonymity that is not possible within in-person methods such as interviewing, which can encourage more honest responses from participants, helping to reduce bias (Marshall, 2005). Questionnaires also present a cost-effective method, requiring few resources to gather a large number of responses, as the researcher does not need to be present while participants complete it (Marshall, 2005; Smith, et al., 2009; Rowley, 2014). This, and the broader reach (particularly when using online platforms) this method offers, can increase the number of participants within the study (even when dispersed over a large area), providing a much larger sample, which is important when using quantitative data (Smith, et al., 2009; Marshall, 2005; Rowley, 2014); however, the study must be designed and managed well to achieve this, as otherwise questionnaires can be prone to low response rates (Marshall, 2005).

When working across a language barrier, it is necessary to ensure these are translated, either through an interpreter if conducted in person, or having a translated written copy available, and then translating written responses back to the original language (Marshall, 2005). However, written formats may rule out some participants, due to low literacy levels, or access to technology (Smith, et al., 2009), which may be particularly relevant for rural community members in Nepal, even in a translated format.

3.3.2. Interviews

Interviews are typically conducted verbally between an interviewer and only one participant (although there are cases with multiple participants present) (Smith, et al., 2009). Depending on the style of interview, this can also allow for more depth and clarification of answers than is possible within questionnaires, providing richer detail from one perspective (Smith, et al., 2009). One-to-one interviews allow for more natural conversation between interviewer and interviewee, while covering the key areas of interest, without trying to balance views of multiple participants (Smith, et al., 2009). This may be particularly beneficial if working with an interpreter, limiting the number of voices to be translated. Additionally, one-to-one interviews can create a safer, private environment than methods with multiple participants present, encouraging participants to share views more freely, particularly for more sensitive or negative perspectives and experiences (Gill, et al., 2008). This may be particularly relevant within this study, if asking participants to share challenges and negative aspects of reconstruction, especially if multiple participants had opposing views or were part of other organisations involved in the projects being discussed.

Practically, arranging one-to-one interviews can be easier than trying to coordinate interviews and activities involving multiple participants at once. As the bulk of this data collection will be conducted in Nepal, presenting significant organisational challenges, this may be beneficial. However, conducting one-to-one interviews is time-consuming, increasing the number of interviews that must be conducted, and the time required to transcribe interviews afterwards (Smith, et al., 2009).

The other consideration when interviewing is the means through which they are conducted, either in-person/face-to-face, or virtually (by phone or video conferencing). Face-to-face interviews offer the opportunity for the interviewer to interpret non-verbal clues, as well as the verbal responses to questions (Ryan, et al., 2009; Smith, et al., 2009), which is important particularly when working across a language barrier. However, they are reliant on fieldwork, reducing the amount of data it is possible to collect, particularly when timeframes for these are limited (Smith, et al., 2009). Given the geographical difference within this research, it would be good to utilise technology in order to increase the number of interviews that could be conducted. However, this can also present many complications, including: access to equipment, unreliable internet connection, time differences, and harder navigating language barriers (Smith, et al., 2009). Virtual interviews also restrict natural conversation flow, and are less suited to participants sharing more sensitive information (Smith, et al., 2009).

There are several forms of interview structure that can be used (structured, semi-structured, or unstructured) (Qu & Dumay, 2011), which are more suited to different purposes, and offer different advantages, which are explored below.

3.3.2.1. Structured interviews

Structured interviews (sometimes called standardised interviews) are formed of a rigid interview schedule, are primarily used to collect quantitative data, although can provide some information relating to views and behaviours of participants (Arksey & Knight, 1999; Qu & Dumay, 2011). They are reminiscent of questionnaires in their question style, although are distinguished by their direct interaction between participant and interviewer (Rowley, 2014). They differ from the semi-structured and unstructured interviews used within qualitative research, as the interviewer is limited to reading only the questions on the interview schedule, without rewording or clarifying questions, or asking follow-up questions (Qu & Dumay, 2011). This is advantageous as it ensures that responses are standardized and replicable, with no room for discrepancies due to specific interview practice of individual interviewers, particularly important when there are multiple interviewers in a research project (Qu & Dumay, 2011).

Structured interviews are formed of a mix of open and closed questions, though in most cases, it is desirable to use mostly closed questions (Arksey & Knight, 1999). Closed questions generally have a list of pre-coded possible responses that are expected, that interviewees can select; these may be specific categories, ranking or attitude scales; this makes it much easier and quicker to record the data, and will save time later in the research process (Arksey & Knight, 1999; Qu & Dumay, 2011). However, closed questions have little scope for interviewees expressing what is important to them, outside of the predefined answers provided, or giving any in-depth insight into their views.

This can be solved to some extent with the use of open questions, in which interviewees are able to discuss more freely their response to the question, to give more information than is possible with closed questions (Arksey & Knight, 1999). However, this comes with the disadvantage that these responses generate far more data, making it harder to record, and requires more time to analyse; therefore, a few open questions can be useful in a structured interview to provide information on key areas of interest, but their use should be limited (Arksey & Knight, 1999).

3.3.2.2. Semi-structured interviews

Semi-structured interviews (sometimes called semi-standardised interviews) typically use a relatively rigid set of interview questions, comprising of both closed- and open-form questions, asked in a consistent and systematic manner to all participants (Qu & Dumay, 2011). This can be beneficial when there are multiple topic areas to cover, with a larger number of shorter questions, but with space for participants to give more detailed responses on key areas than is possible in structured interviews (Qu & Dumay, 2011). This approach helps to achieve a good balance of control between interviewer and interviewee; the interviewer controls the overall interview direction (ensuring key topics are covered), but the interviewee has freedom to discuss areas of importance relevant to themselves, which is beneficial when identifying new areas not previously considered (Qu & Dumay, 2011).

A semi-structured interview approach also offers greater flexibility than is possible in a structured interview (Qu & Dumay, 2011). There is freedom for interviewers to reword questions or ask additional probing questions based on participants' responses (Berg, 2001; Qu & Dumay, 2011). This is particularly beneficial given the language barriers and cultural differences to provide clarity, or to investigate particular areas of interest raised that are not covered within the interview schedule.

3.3.2.3. Unstructured interviews

The last format of interview is an unstructured interview (sometimes called open interviews), predominantly providing qualitative data (Qu & Dumay, 2011). Unstructured interviews typically have fewer questions, of an open form; this gives participants space to go into much greater detail into a few key topics, providing more in-depth insight into their perspectives. This also allows more scope to build rapport with participants, and creates a more interviewee-led conversation, giving them greater control over the direction of the interview and the information they share, which can be beneficial if exploring more personal and sensitive topics (Qu & Dumay, 2011).

It is good practice to outline the core interview questions set out within an interview schedule. However, there is much greater flexibility than is possible in structured- and semi-structured interviews, enabling the interviewer to ask follow-up questions to explore topics raised in greater detail (Qu & Dumay, 2011). This is particularly useful in identifying specific experiences and narratives relevant to individual participants, and when the necessary questions to ask are not clear at the outset (Qu & Dumay, 2011).

3.3.3. Focus groups

Focus groups (or workshops) provide the opportunity to create dialogue between the researcher (known as a moderator) and multiple participants at once (Smith, et al., 2009; Qu & Dumay, 2011; Lune & Berg, 2017). They are not intended to collect data from individual participants simultaneously, but through sharing and discussing experiences and views, it is possible to understand the collective views of the group as a unit (Lune & Berg, 2017; Davies & Hughes, 2014). This can be particularly beneficial if trying to collectively find solutions or evaluate specific items or circumstances (Smith, et al., 2009; Lune & Berg, 2017). However, this can be a less effective method if there are potentially negative or controversial views held by individual participants, particularly those relating to other participants present (Smith, et al., 2009); this may restrict the amount of information shared, or skew responses to be more positive, affecting the validity of the data collected. Similarly, when multiple participants from different backgrounds are present (e.g., with imbalance in levels of education, or in positions of power/responsibility), this can create unhelpful power dynamics, which may limit the amount of information shared by some participants (Lune & Berg, 2017). This can take the form of powerful participants monopolising conversation, or establishing a prominent view which others present may then adopt through pressure (Lune & Berg, 2017)

Logistically, these can be more challenging to arrange, requiring all participants to be present in the same location at the same time (either in person or remotely, if using virtual platforms). They can also be more challenges in ensuring that views are ascribed to the right individual when recording and transcribing interactions (Lune & Berg, 2017; Davies & Hughes, 2014).

Additionally, when working across a language barrier, all participants must be being willing to wait for dialogue to be translated by an interpreter, which can limit the control the researcher has. However, they can be more efficient and cost/resource effective, as multiple views are gathered in one go, rather than requiring many individual dialogues (Lune & Berg, 2017). This method can also allow for further insight to be gained through researcher observation, witnessing the dynamics between different participants, which may add depth and understanding to the responses offered (Lune & Berg, 2017).

3.3.4. Observations and complementary work

As well as data collection involving responses from research participants within questionnaires, interviews, and workshops/focus groups, there are other activities that can provide additional insight. These activities are typically not designed to provide further insight into the specific research questions, but can provide broader understanding, outside the core focus of the study (McCulloch, et al., 2000). This can be beneficial when exploring wider generalisations of findings, and applicability to other sectors.

Complementary activities can take multiple forms. Researcher observations, one of the primary methods available, are conducted in the field, are insights gained directly by the researcher, which may include witnessing physical settings, activities or interactions first-hand (Angrosino & Rosenberg, 2011; Smit & Onwuegbuzie, 2018). Participant observation offers a method through which researchers can conduct long-term observations from within a given context, for example by taking part in daily activities or interactions (DeWalt & DeWalt, 2010; Emerson, et al., 2007). Transect walks offer another form of observation, in which a systematic study of a place can be conducted (e.g., observing hazards, or gaining perspectives of participants along the transect being studied (Ackerly, et al., 2017). Observations are typically documented within fieldnotes (Davies & Hughes, 2014), keeping a record of what was seen and conversations that were had (DeWalt & DeWalt, 2010; Smith, et al., 2009). They can also be supported by visual methods (e.g., photographs, videos, sketches) taken by participants or the researcher (Smith, et al., 2009; Davies & Hughes, 2014).

While observations can provide additional understanding, they can still be limited to what participants make visible, and it is possible for key insights to remain hidden (Smit & Onwuegbuzie, 2018). Therefore, these methods can be most effective when forming complementary work, alongside other research methods (known as triangulation, discussed in Section3.3.5), adding further detail and understanding to participant responses (Arksey & Knight, 1999; Webb, et al., 1966; Lune & Berg, 2017).

Other documentary evidence (also known as unobtrusive measures) may also be used (for example written records, media reports, policies, drawings, maps), collected or witnessed by the researcher, without needing direct interaction with research participants (Lee, 2000; Webb, et al., 1966; Lune & Berg, 2017). Lastly, interviews and meetings, outside of core interview/questionnaire schedules, can be conducted, with other experts involved in the field of research; this can provide broader understanding of the field of research (e.g., academics, or stakeholders involved with work in similar sectors).

3.3.5. Blended research and triangulating methods

A blended research approach utilises multiple research methods to 'obtain rich and thick data' (Fusch, et al., 2018); for example, combining case studies and narrative data collection. Blended research is important as it allows for triangulation of data, exploring the same research question using different methods, to improve robustness of the study, and overall depth of understanding (Webb, et al., 1966; Pryszlak, 2019). For example, triangulating methods may take the form of collecting data through both structured and unstructured interviews, complemented with researcher observations (Arksey & Knight, 1999). Alternatively, one research method may be conducted with multiple groups of people, (e.g., different sets of stakeholders), in order to compare these sets of data (Arksey & Knight, 1999). Triangulation should not just be using as many research methods or data sources as possible, but instead combining and balancing specific approaches, to overcome weaknesses of individual methods (Denzin, 1978; Jick, 1979), to gain deeper insights, and to better represent the complexity of the field being investigated (Arksey & Knight, 1999; Lune & Berg, 2017). There are two distinct goals of triangulation, either confirmation, or completeness (Arksey & Knight, 1999). Triangulation for confirmation may take the form of either a 'between methods' approach (using multiple research methods), or 'within methods' approach (using multiple variations or participant groups within the same method) (Denzin, 1978). These enable comparison of the data, in order to test the degree of external validity, or internal consistency and reliability respectively (Jick, 1979). Conversely, triangulation for completeness, particularly when using qualitative methods, can provide greater detail within data, with a more holistic, contextual depiction of the topic being studied, identifying factors that may have otherwise been missed (Jick, 1979).

Triangulating research methods within this study would be beneficial, particularly when working within a number of constraints on location, time and resources. This would provide the opportunity to collect more in-depth, rounded data, and greater contextual understanding, as well as being able to compare and contrast perspectives from multiple stakeholder groups involved in Nepal's school reconstruction process.

3.3.6. Case studies

Case studies present a specialised form of triangulating methods, utilising a combination of questionnaires, interviews and complementary activities (Poteete, et al., 2010; Davies & Hughes, 2014). This is a specific method to intensively investigate individual people or groups, or specific examples of concepts or contexts of interest (DeWalt & DeWalt, 2010; Davies & Hughes, 2014). Case studies can be conducted with one or multiple participants regarding the same item (Walker, 1983) (e.g., multiple stakeholders involved in the same school), although it may be challenging to access multiple stakeholders. They can also provide specific insights and narratives of factors, particularly of more personal experiences, and aid in making sense of complex processes (DeWalt & DeWalt, 2010), and enable direct comparisons of narratives and insights between different contexts. However, caution should be used with case studies, acknowledging that they are still open to the same flaws found in questionnaire and interview methods, and can provide a biased, or conservative view (Walker, 1983; DeWalt & DeWalt, 2010).

For the purpose of this research, case studies present a valuable research method, to investigate individual case-specific experiences of school reconstruction in Nepal. This would provide a means to understand stakeholder experiences for specific contexts, supported by visits to the schools to observe and record context first-hand (e.g. accessibility, school layout, and site constraints).

3.4. Study design

As well as choosing the most appropriate research methodology, it is important to consider the logistics and practicality of conducting this research, including the design of interview and questionnaire schedules, where these will be conducted, identifying, and approaching participants, language barriers, and recording the data.

3.4.1. Validity and reliability

Having selected the appropriate research methodologies, it is then necessary to produce the specific study design, typically either a: questionnaire; a rigid interview schedule (for surveys and structured interviews); or interview guide (for semi-structured and unstructured interviews), building in flexibility (Arksey & Knight, 1999). When planning the design of a study, this should consider the principles behind the research, the key research questions, and the reason for asking each question, which should aim to provide valid, reliable data (Arksey & Knight, 1999).

For survey research, seeking comparable data, complete reliability is unattainable; however, reducing interviewer bias is key to improving reliability (Arksey & Knight, 1999). This requires that results and data are not skewed by either the design and methods of the research, or through interviewer behaviour, for example, by limiting variation in how questions are asked, and how much clarification or repetition is offered (Arksey & Knight, 1999).

Conversely, for qualitative studies, responses are situational and conditional, providing understanding of specific circumstances, therefore there is not one 'truth' for all participants and responses (Rubin & Rubin, 1995). This makes traditional reliability and validity difficult or implausible to attain, instead requiring demonstration of the suitability of their research methods for the given context (through evidencing the reason for the study and value of the outcomes and ensuring the appropriateness of the questions used) (Arksey & Knight, 1999). Reliability in qualitative studies can also be considered within three factors. Firstly, in methodological transparency and consistency, evidencing clear decision-making process and accounting for potential inconsistencies and bias within the method and action (Rubin & Rubin, 1995; Arksey & Knight, 1999). Secondly, in the trustworthiness of data, evidencing that data collected fairly represents participants' views (through triangulation of methods, clarifying and checking understanding, and accounting for inconsistencies) (Arksey & Knight, 1999). Thirdly, in authenticity and researcher neutrality, acknowledging researcher bias and subjectivity, which may not be removed but should be considered and accounted for (Arksey & Knight, 1999; Lather, 1986).

3.4.2. Question design

Choosing the right questions is key to achieving reliable, valid data. Arksey & Knight (1999) highlight that validity is enhanced by: having questions that are informed by literature, and by pilot studies; questions covering all key aspects of the research questions; not asking unnecessary or irrelevant questions, that do not add to the research questions; and ensuring that enough time is given in interviews, to fully explore all the questions.

As well as ensuring that questions cover the key information needed, it is also important to adopt an appropriate style of questions. Choosing appropriate terminology (both contextual and technological) is important to ensure participants have a clear understanding of the question being asked (or that clarification is provided) (Arksey & Knight, 1999; Marshall, 2005; Rowley, 2014). Similarly, descriptive/intensifier terms (e.g., 'regularly', 'many', 'few') should be used with caution, acknowledging that they are imprecise and may hold different meanings for different participants, or situations (Arksey & Knight, 1999; Marshall, 2005). Rigid guidelines on their definitions within the study could be provided, or alternative strategies include asking participants to rank, rate or categorise factors (Arksey & Knight, 1999).

When wording questions, it is also important to avoid using prejudicial or assumptive language or leading questions (Smith, et al., 2009; Marshall, 2005). Prejudicial language, suggesting specific beliefs or views on gender, race or similar, would be unprofessional and can serve to alienate interviewees which may affect the answers they give (Arksey & Knight, 1999; Marshall, 2005). Assumptive questions may have similar outcomes, suggesting an initial set of conditions that may not apply to all interviewees (Arksey & Knight, 1999; Marshall, 2005). This can make it hard to answer the question, or alienate those who do not fit those criteria, or imply a specific response. Leading questions can also bias the answers interviewees give, swaying answers to a particular viewpoint, due to implicit suggestions in the question (Smith, et al., 2009; Arksey & Knight, 1999; Marshall, 2005).

There is mixed feeling towards the use of hypothetical questions. Arksey & Knight (1999) and Marshall (2005) acknowledge that hypothetical questions can incur misleading or inaccurate responses, as it cannot be guaranteed that people's behaviour they report to a hypothetical situation or scenario would mirror their behaviour when faced with the actual situation. However, there is also an argument that hypothetical questions may be suitable for interviewees with relevant experience to the scenario being posed, as their responses should be reflective of their true behaviour (Arksey & Knight, 1999). With this in mind, the use of hypothetical questions may be suitable within this study, given that participants are all directly involved with school reconstruction in some capacity; for example, this could provide insight into potential improvements or changes that could be made, if implementing a hypothetical/future reconstruction project, informed by their past experience.

When designing questionnaires and interviews, it is important to consider the order of questions as well as the content, and while there are guidelines for this, this will be informed by the specific research being undertaken (Rowley, 2014). Principally, questions should be grouped thematically, with questions exploring a single topic clustered together (Rowley, 2014; Lune & Berg, 2017; Qu & Dumay, 2011). Double-barrelled questions (asking two questions in one, e.g., how, and why) can also cause confusion for participants and may lead to ambiguity in their responses (Arksey & Knight, 1999). Conversely, when interviewing, by building rapport and trust throughout, this can encourage participants to share more openly and fully, helping to improve the validity of their response (Arksey & Knight, 1999; Lune & Berg, 2017; Qu & Dumay, 2011). Marshall (2005) also highlights this practice when designing questionnaires, in order to improve response rate. However, caution is needed, so that sensitive questions are placed so far into an interview schedule that this can feel manipulative, particularly where these form the main focus of the interview (Lune & Berg, 2017). Therefore, when designing studies within this research, the following approach may be utilised: firstly, opening with simple questions of a factual nature that participants should find easier to answer, followed by asking questions of a potentially sensitive nature once participants feel more at ease, before ending on more positive questions (Arksey & Knight, 1999; Marshall, 2005).

Particularly when designing interview questions, it is important to consider prompts that could be used, to clarify questions, or encourage participants to provide greater, or more specific detail, or clarify their meaning, in order to improve validity (Arksey & Knight, 1999; Smith, et al., 2009). By building these into the design, this provides greater continuity between interviews, ensuring that participants all receive similarly worded questions. Validity can also be improved by considering flexibility within the design, enabling the interviewer to respond and follow up unforeseen avenues identified by participants, making the most of the opportunities an interview can provide (Arksey & Knight, 1999).

3.4.3. Participants

3.4.3.1. Number of participants

When planning this study, it is important to consider the number of participants that will be involved, in order to provide sufficient quantity, and confidence in the data collected, but is feasible to achieve. Baker & Edwards (2012) suggest that there is no definitive answer for the right number of participants, but that this is influenced by a range of factors: the scope of the study; constraints of time and resources; the practical challenges of conducting interviews in the given context; the familiarity of the researcher and participants with the research focus; and homogeneity of the research population (Baker & Edwards, 2012; Bonde, 2013; Brannen, 2012).

Within literature, there is a wide range of recommendations of study size, including: between 12 and 60, by Adler & Adler (2012); a minimum of 20 (Warren, 2002); and between 15 and 60, by Saunders & Townsend (2016). With a wider window, Brannen (2012) recommends that anywhere between one and 260 participants would be appropriate, depending on factors mentioned previously. Baker and Edwards (2012) also indicate that even one participant can provide valuable data, as this provides a number of insights to be investigated. They also suggest that a small number of responses can still provide insight into the range of responses and indicate that a phenomenon is more varied and complex than previously thought, although they highlight that smaller numbers can limit the potential for establishing frequencies of responses (Baker & Edwards, 2012). Guest, et al. (2006) suggest that for studies with a narrow scope and homogenous audience, key themes can be identified after only six interviews, with data saturation typically occurring after 12. Ragin & Amoroso (2011) and Baker & Edwards (2012), also discuss the concept of data saturation, as the point at which no new evidence is being identified, indicating commonalities than can then be investigated in further detail. This is echoed by Arksey & Knight (1999), highlighting that as few as eight intensive interviews are needed to investigate a topic, while large numbers of participants are required if wanting to generalise findings for a full population.

While this research will make some attempts to provide quantitative insight and comparison between responses, the key data collected will relate to qualitative narratives indicating challenges, good practice and contextual information. Given this, and the limited scope and resources of the study, the number of participants in each phase will be small (approximately 10-20); while this may not be enough to reach data saturation, this should be sufficient to provide a wide range of data points to examine, and identify key themes and patterns within responses.

3.4.3.2. Choosing and sampling participants

As well as deciding the number of participants required, it is also important to consider how participants will be selected, known as sampling (Smith, et al., 2009). There are a range of sampling approaches available, outlined by Smith, et al. (Smith, et al., 2009): random (using criteria unrelated to specific characteristics, to select a proportion of a large, homogenous population); stratified (random sampling applied to specific sub-groups to provide desired proportions of different characteristics); clustering (sampling within naturally-occurring groups of a larger subset); probability (random sampling designed to achieve equal likelihood that a given characteristic will be selected); and purposive, or theoretical (introducing researcher selection).

Choosing an appropriate method of sampling for the purpose of the research is important to improve the validity of the data collected (Arksey & Knight, 1999). Of these, theoretical sampling is particularly of interest for this study, as it is commonly used within qualitative methods which do not rely on representativeness for validity (Smith, et al., 2009). In this approach, participants can be identified due to a specific contextual/conceptual link to the study (Strauss & Corbin, 1998; Glaser & Strauss, 1967). This should take into consideration practical constraints of time, cost and access to participants, while identifying a sample that will provide the full range of all relevant perspectives (based on the specific field of research) (Arksey & Knight, 1999).

The sample used can affect the applicability and suitability of generalisations that can be made from the data collected, particularly for small or narrow samples (Arksey & Knight, 1999). However, as discussed by Stenhouse (1980) and Walker (1983), even when samples are not wholly representative, many insights may still be reflective of the whole situation and context, and both the researcher and reader can make inferences and judgements of these. Due to the scope of this study, the size of samples will be small. However, the ability to make generalisations from these findings will be improved by triangulating methods and investigating both case-specific and broader perspectives, reflecting a broader range of contexts. Additionally, much of the insight gained will relate to challenges identified in other sectors, or technical considerations, both of which will be supported by wider literature.

There are different means through which samples and study participants can be identified and approached. For example, within random sampling, there will be no prior connection to participants, and will likely be accessed through remote methods such as email or phone. A similar approach may be used in other sampling methods, although with a more targeted subset of potential participants. Alternatively, more personal approaches may be used, either through direct contact or through mutual contacts, which are more suitable with purposive, theoretical sampling. This may involve personal email/phone contact for specifically targeted participants, who may have been independently identified, or already known to the researcher. Alternatively, it can be beneficial to approach participants through mutual contacts, if it is hard to access participants directly. This may be particularly necessary within this research, in which it may be difficult to identify specific contacts within schools, or for participants in positions of power, such as government representatives. One form of this is using a snowballing approach, in which identification of a small set of participants may lead to identifying further participants, increasing the sample size and potentially broadening the perspectives offered (Davies & Hughes, 2014). Snowball sampling can be done by the researcher, e.g., based on content identified within interviews, or with the assistance of participants or a gatekeeper who may recommend or pass on studies to their own relevant contacts (Davies & Hughes, 2014).

3.4.4. Conducting the research

When planning and designing research activities, there are several factors that must be considered, regarding: where, and how, activities and research methods will be conducted; the implications of language barriers; how data will be recorded; and ensuring research is conducted ethically. These are outlined in the following sub-sections.

3.4.4.1. Fieldwork studies

As this research has a focus on Nepal, considering the locations is particularly important when designing the study. As discussed in Sections 3.3, some research methodologies (i.e., questionnaires or interviews) can be conducted remotely through online, phone or video formats, which could enable easier access to a larger number of participants, particularly those in more remote, or harder to access locations (e.g., in humanitarian or conflict settings), and have benefits of reduced environmental impact and require less resources (Chiumento, et al., 2018). However, there are also challenges to using these remote research methods. Access to technologies, such as mobile phones, and reliable internet services may be limited, which would limit the effectiveness of many interview approaches conducted using web-communications (Chiumento, et al., 2018). Written forms of interviewing, e.g., through email exchanges also present challenges, in part due to the accessibility of these platforms, and particularly due to the language barrier, discussed further in Section 3.4.4.2. Chiumento, et al. (2018) also highlight: the potential for an imbalance of power; that it is harder to convey meaning; that it may not be possible to control the interviewee's environment, which may have implications for confidentiality (which must also be considered when choosing the platform through which the interview is conducted; and the implications and ethical considerations of the imbalance in relative safety of the interviewer and interviewee.

Given these constraints, it will also be beneficial to conduct fieldwork studies, providing greater scope for using in-person research methods, such as interviews, and researcher observations. However, field studies also present their own challenges, which must be considered when planning research. Time spent in the field is limited, as well as greater costs associated with travel. Therefore, carefully planning work is important to maximise the use of these resources; however, this may be difficult, due to the flexible ad hoc nature of work in Nepal, in which it may be necessary to plan activities at late notice, or take up new opportunities (such as meeting with new participants). It is also important to ensure that field work is conducted safely, through preparing a sufficient risk assessment, governing working practices and procedures that should be followed. The risk assessments used in this study are provided in Appendix B.

3.4.4.2. Language barrier

As this research will be conducted in Nepal, it is important to consider the implications of working in a different context and across a language barrier. As this study encompasses some technical aspects, it is important to ensure that the words and phrases used when designing studies are understandable, and in keeping with local terminology (Marshall, 2005; Rowley, 2014); this applies for both technical and non-technical participants. Where key terms are required (particularly ones that can be ambiguous or have multiple interpretations), these should be explained clearly, to accurately reflect their meaning; this would apply to words such as ‘infrastructure’, ‘technology’, and terms relating to specific construction methods (e.g., reinforced concrete, ring beams, masonry, tying, and members).

Interviews and questionnaires should only be conducted in English (or the relevant second language), when participants are fully proficient, so that the full detail of responses can be maintained (Murray & Wynne, 2001); in this study this is likely to only apply tow those working in government roles and within international NGOs, but this will not be the case for all participants. This means that written material (i.e., online questionnaires) should be produced both in English and in Nepali and would also requiring translation of responses. However, it should also be noted that for some participants, there may also be limited literacy in Nepali, which would impede the quality and effectiveness of written research methods. For verbal interactions (i.e., workshops, interviews), it will be necessary to work with an interpreter (Edwards, 1998).

Bergen (2018) highlights that there is no strict way in which this should be done, and best practice may vary over time, related to the experience of the researcher and the specific research context. However, they also highlight that their use should still be carefully planned and considered from the outset of the research, accounting for this within the study design, and acknowledging the additional time this will add to interviews (Bergen, 2018; Chiumento, et al., 2018; Bragason, 1997). Regardless of how interpreters are used within interviews, it is good practice to retain elements of behaviour from one-to-one interviews. It can be beneficial for the interviewer to be able to greet the interviewee in their own language, and know a few other key phrases that may arise within the interview, to give some common ground (Bragason, 1997). It is also beneficial for the interviewer to address questions to, and maintain good eye contact with, the interviewee throughout the interview, as well as nodding and smiling at responses, to show understanding and engagement, and build up trust (Bragason, 1997; Edwards, 1998). Edwards (1998) also highlights that even when working through an interpreter, some interviewees will want to speak occasional English, to share particularly important responses, or will encourage interpreters to emphasise these points; this indicates that it is important to not overlook the role and power an interviewee holds within an interview, even when working across a language barrier.

When interpreters are needed, it is important to consider how they will be selected. As a given, interpreters should be fluent in both languages (and any relevant local dialects), and should have a good local and cultural knowledge and familiarity (Bragason, 1997). Edwards (1998) suggests that it is best to use trained, or professional interpreters. Bragason (1997) highlights that achieving this can be unrealistic, although they recommend that it is still beneficial to use an interpreter with a good understanding of the research context and subject, so they are comfortable with area of questioning. Murray & Wynne (2001) suggest that it is also beneficial to use an interpreter with experience with conducting qualitative research, so that they are familiar with typical interview practice.

There is debate over how similar or close interpreters should be to interviewees. Particularly within some cultural settings, there may be power dynamics which limit the information interviewees are willing to share when interpreters do not match their own identity (e.g., gender, background and status) (Chiumento, et al., 2018; Bragason, 1997; Edwards, 1998).

However, Murray & Wynne (2001) also highlight that in some cases, having an interpreter of a different background or identity may also give an interviewee freedom to report things that they would otherwise feel uncomfortable doing, if these would counter traditional norms. While it is beneficial for interpreters to have a good understanding of the local context, there are also risks of being too closely involved or connected, which may also inhibit sharing personal responses (Murray & Wynne, 2001; Edwards, 1998). There is also the danger that choosing an interpreter too closely linked may lead to interpreters not translating everything interviewees say, if it could be perceived to negatively reflect themselves or the culture (Murray & Wynne, 2001); they highlight that in these cases, it is good practice for interviewers to be aware of body language, tone, and other indicators that may suggest that what is being interpreted does not match the interviewee's response.

It is important to ensure that interpreters are adequately briefed and trained prior to conducting research (Edwards, 1998; Bergen, 2018). The purpose and subject of the interviews should be outlined, highlighting specific wording and meaning of questions asked, particularly for technical aspects, and areas where additional questions may arise (Edwards, 1998; Bergen, 2018; Bragason, 1997; Murray & Wynne, 2001); however, Bragason (1997) highlights that this should be limited in studies testing rigid hypotheses, in order that interpreters are not biased in how they present interviewees responses. They also suggest that structured or semi-structured interviews may be more appropriate when working with an interpreter, so that there is a clearly defined set of interview questions (Bragason, 1997). Murray & Wynne (2001) highlight two different approaches that could be used within this: firstly, providing the interpreter within the rigid interview guide, requiring the interpreter to work through these systematically, with only direct interpretation of responses; conversely, the interpreter was shown a list of the topics and the associated questions to be discussed, but was given freedom to cover these in a natural manner, guided by the flow of conversation, feeding back the questions and answers being discussed to the interviewer. The first approach allowed the interviewer to retain greater control on the interview, while the latter provided greater depth of responses as the interpreter was able to probe further, and was more suitable for more emotive subjects, allowing the interpreter to respond more naturally and appropriately to the interviewee (Murray & Wynne, 2001; Edwards, 1998). Edwards (1998) frames this debate as working 'through' versus working 'with' an interpreter; they recommend the latter, highlighting that the interpreter should have some autonomy within the interview, although they suggest that this should be a relatively passive role.

Additionally, briefings should set out the role, and expectations, of the interpreter (Bergen, 2018; Murray & Wynne, 2001). This will include outlining the ethical considerations (e.g., maintaining confidentiality), and boundaries they should adhere to (e.g., selecting what to translate and how it is translated) (Murray & Wynne, 2001; Bragason, 1997). This can also be an opportunity for the interpreter to provide insight into cultural norms (e.g., proprieties and body language) for the interviewer, to aid interpretation of behaviours within the interview (Murray & Wynne, 2001). There is debate over whether interpreters should speak in first or third person when translating, although in reality, it is likely that many interpreters will vary their practice throughout an interview (Murray & Wynne, 2001). Baker, et al. (1991) recommend first person translation, as this provides a direct translation of participants responses, and a clearer interviewee voice when studying interview transcripts. Conversely, Edwards (1998) suggests that third person translation ensures the interpreter is visible and to separate their role from the interviewee. This approach acknowledges that having an interpreter present will impact on the dynamic of the typically one-to-one setting of an interview, creating a complex three-way interaction (Edwards, 1998). Working through an interpreter can make it harder to build rapport, and may make it more difficult for interviewees to share sensitive, emotional or private details (Chiumento, et al., 2018; Murray & Wynne, 2001).

When working through an interpreter, there may also be concerns over the quality and accuracy of the translation. It may not always be possible, or appropriate to provide a direct translation of an interviewee response, or where this would not adequately convey the meaning (Bragason, 1997; Murray & Wynne, 2001); for example, there may not a parallel phrase available, or phrases associated with a specific tense or gender may be misrepresented. However, it can be useful to use follow up questions to ensure meaning is understood accurately (Murray & Wynne, 2001), and interpreters should be encouraged not to over-paraphrase when translating, to minimise the negative implications of this (Bragason, 1997). As highlighted above, when conducting in-person interviews, meaning is also conveyed through tone and body language, which can also indicate when there may be disparity between interviewee and interpreter responses. Where necessary, for interviews that have been recorded, there is also the potential to seek third-party, independent translation of recordings, to verify interpreter accuracy (Bragason, 1997; Murray & Wynne, 2001).

3.4.4.3. Recording data

When conducting research, regardless of the methods chosen, it is imperative to effectively record any data collected. For written methods (e.g., questionnaires), participants responses can be recorded directly when completing them, either on paper/digitally, or online. Therefore, it is useful to consider both the platform and question styles used when producing the questionnaire, so that the data collected can be provided in the desired format. For online platforms, data is automatically recorded and can be downloaded in different file types, depending on the needs of the researcher (e.g., Excel or CSV files).

For some observational data, this can be recorded digitally at the time of the observation e.g., through sketches, photographs or videos of objects or items of interest, or scans of documents (Davies & Hughes, 2014; DeWalt & DeWalt, 2010; Smith, et al., 2009). Alternatively, researcher observations may be recorded in the form of field notes such as a journal or logbook, for example, outlining an event or situation witnessed, or detailing an interaction with someone (Davies & Hughes, 2014; DeWalt & DeWalt, 2010; Smith, et al., 2009). They recommend that these are recorded immediately following the observation, to ensure as much detail as possible is retained, and that it is an accurate reflection of what was observed.

For spoken data, such as interviews and verbal questionnaires, audio or video recordings can be used to provide a record as they are being conducted (Poland, 1995; Murray & Wynne, 2001; Bragason, 1997). Typically, these recordings will then need to be prepared, and transcribed into a written format in order to analyse and study the data, which is detailed in Section 3.5. However, audio recordings are not able to capture the non-verbal communication present in interviews, such as emotion and body language (Poland, 1995). Poland (1995) also highlight factors that can affect the quality of audio recordings, including: not being able to hear properly due to background noise; placement of the recording device; or participants speaking too quietly, quickly, or unclearly; and issues with the recording device itself; either not being a sufficient quality; or running out of battery. Video recordings can provide a fuller record of the interview/questionnaire, in which some elements of body language can be identified (Garcez, et al., 2011). However, they can also be affected by the same issues facing audio recordings, as well as the potential for poor image quality in badly lit environments, as well as being resource intensive, requiring a large storage capacity for the large files (Garcez, et al., 2011). Garcez, et al. (2011) highlight that video recordings should not be transcribed, due to the loss of richness of information, that cannot be conveyed in text. Powney & Watts (1987) also recommend caution, suggesting that the most interesting insights may be given while the recording device is turned off; while it may not be possible to eliminate this entirely, there are steps that can be taken to reduce the likelihood, discussed further in the following section.

3.4.4.4. Research ethics

Conducting research ethically promotes quality and validity within the research and findings, protecting against poor research practice (Smith, et al., 2009). There are a number of responsibilities that must be met when conducting social research (Holden, 1979; Qu & Dumay, 2011). This requires protecting the rights, welfare, and interest of research participants, and others involved in the research (e.g., funders, colleagues), when conducting and disseminating research (Arksey & Knight, 1999; Smith, et al., 2009; Qu & Dumay, 2011). It is particularly important to consider the ways in which balancing these may cause conflicts of interest, and how these could be addressed within the research design.

There can be negatives for research participants within the process: highlighting/raising sensitive topics inducing embarrassment, distress, or inferiority; costs associated with taking part (e.g., lost work time); and potentially harmful portrayals of them within publications or the media (Arksey & Knight, 1999; Qu & Dumay, 2011). Conversely, there is also scope for benefits to participating in the research: satisfaction of contributing to new knowledge; enjoyment of taking part; gaining new knowledge, particularly if there is a suitable follow-up procedure in place; discussing views, particularly personal experiences can be cathartic; and some studies may provide financial reimbursement or reward for taking part (Arksey & Knight, 1999). In this study, while some topics addressed may be sensitive in nature, these will be focused within factual, practical, and technical details, rather than personal, to limit the potential for inducing negative emotions for participants. It is not feasible within this study to provide monetary rewards for taking part. However, where possible, all participants will be included within the validation process of the research, in which they will receive a copy of the proof-of-concept framework produced based on the research findings; as this will be relevant to their sphere of expertise and experience, they may find this interesting or useful.

It is also important to gain appropriate, informed consent from participants before undertaking research activities, ensuring that they have a good understanding of the impact of taking part of in the study (Lune & Berg, 2017; Smith, et al., 2009; Qu & Dumay, 2011). For qualitative studies, participants should be told about: the purpose and methods of the study; potential benefits, risks and costs; researcher contact details; funding/sponsorship details; an overview of the content and length of the questions; reassurance that they are entitled to not answer any given question, or withdraw from the study entirely; agreements for anonymity and confidentiality, including what information will be disclosed; and where the findings will be disseminated (Arksey & Knight, 1999; Lune & Berg, 2017; Smith, et al., 2009). For this means of informed consent, it is typical to record participants' consent in writing, signed by both the participant and interviewer, as will be done in this study (Lune & Berg, 2017; Smith, et al., 2009; Qu & Dumay, 2011). As these records show participants' names, which could jeopardise anonymity, these forms will be kept secure and separate from the study data, and will be destroyed at the end of the study. For quantitative questionnaires, particularly those conducted online, and on a large scale, consent may instead be implied rather than given in writing, demonstrated in participants choosing to complete and submit the questionnaire (Lune & Berg, 2017; Smith, et al., 2009). In these cases, the level of information provided regarding details of the study may be smaller, but should still indicate the purpose of the research, and associated risks and benefits (Arksey & Knight, 1999; Lune & Berg, 2017; Smith, et al., 2009).

In line with guidance (e.g., (Arksey & Knight, 1999; Lune & Berg, 2017; Qu & Dumay, 2011), research data will be presented anonymously and confidentially within all published work (including conference and journal papers, and this thesis). Therefore, the names of participants should not be included or shared, as well as any key information from which the identity of participants could be assumed (Lune & Berg, 2017; Qu & Dumay, 2011). It will be particularly important to reassure participants of this, allowing them greater freedom to share more challenging aspects and experiences of projects, which could reflect negatively on themselves, or on specific projects.

Similarly, it is also important to consider the impact and implications of power and inequality between the interviewer and interviewees, particularly for those in less prominent or 'expert' positions (such as school representatives within this study) (Arksey & Knight, 1999), viewing the interviewer as someone highly educated, official, and in a position to scrutinise and pass judgement on projects or their involvement. This could lead to participants being unwilling to share negative aspects of projects that, for example, could have an impact on the quality of construction, skewing the data. While reassurance of anonymity and confidentiality may help to minimise this, it will also be important to stress that the interviews will not be used to assess the quality of construction, or make judgements on their actions, although serious concerns can be discussed with the supervisory group if appropriate.

Each of these factors is outlined within a study protocol, produced for each set of fieldwork conducted within this research (provided in Appendix C). These detail the purpose and content of the study, the groups of participants who will be involved, researcher obligations, and guidance for interview conduct (including gaining informed consent, recording interviews, reassurance of confidentiality, and confirmation that participants are not required to answer any questions they do not want to.

3.5. Data preparation and analysis

3.5.1. Transcribing recordings

It is important to ensure that transcriptions of verbal dialogue (e.g., interviews, focus groups) provide a 'verbatim' account of the conversation (Patton, 1990; McCracken, 1988; Poland, 1995). This enhances the reliability of the data, as this provides a written representation of participants views (Arksey & Knight, 1999). However, it should be noted that this is a very lengthy process, so enough time should be built into the research programme to do this effectively (Smith, et al., 2009). Additionally, as recordings cannot reflect non-verbal communication, this also cannot be represented within transcriptions, and therefore transcriptions can never be fully accurate portrayals of the interviews conducted (Poland, 1995). Poland (1995) also highlight a number of errors that can be made in the transcription process, including: mishearing, or mis-recording words/phrases; changing sentence structure; incorrectly representing punctuation (e.g., interviewee's use of quotation marks, questions or exclamations); or omitting words, either by accident or to make the transcription neater.

However, there are steps that can be taken to improve the quality of the transcript, using a system of transcription symbols (such as those outlined by Silverman (2007) and Poland (1995), to better represent the syntax within audio data. Silverman's (2007)system included: left square brackets ([) to indicate overlapping voices; noting the length of silences in parentheses (.2); capitalising loud words or phrases; colons (e.g., o:kay) to represent prolonged sounds; empty parentheses for unknown words; single parentheses around a possible word if unclear; double parentheses around author descriptions. Poland's (1995) system differs, using: short pauses identified by a series of dots (…), or using (pause) or (long pause) for longer breaks; hyphens (-) to indicate interruptions; descriptors indicated in parentheses, for noises (e.g., (laughing), (coughing)), or interrupted speech (e.g., (overlapping)); square brackets with a question mark around unclear words; x's denoting longer passages that could not be heard, approximately representing the length of the phrase; capitalising loud phrases/emphasis; and repeated hyphens and letters (e.g., No-o-o-o) to indicate held sounds.

The system outlined by Poland (1995) will be adopted within transcriptions produced in this research. However, as Arksey & Knight (1999) discuss, conversation does not typically mirror written prose (e.g., using abbreviations, tics such as 'er' and 'um', and repeating words/changing sentence direction). Oliver, et al. (2005)highlight inclusion of these elements of speech as a continuum, in which a naturalistic approach would retain these (to best represent the spoken language), while a denaturalistic approach (most suited to grounded theory methodologies) would remove them (arguing that the true meaning is still conveyed within the words). While abbreviations and repeated words will be retained (to match the participant phrasing used), other elements of speech (e.g., tics, stutters) may be removed, particularly when these will not significantly contribute to the research findings and analysis (Arksey & Knight, 1999; Oliver, et al., 2005). For this research, tics will not add to the overall narratives investigated, and are likely to generally represent pauses to think, or find the right word (particularly when speaking in a second language); therefore, they will be indicated as pauses within the transcripts.

There may be lone, or multiple transcribers used within a study, and if external, it can be valuable to engage them more fully within the study, aside from solely transcribing the recordings, for example: by providing their feedback on the tone and quality of the interview, or also being involved with coding of the data for analysis (Poland, 1995). In this research, transcriptions will also be prepared by the interviewer, aiding recollection of words and phrases where these are unclear in the recording; this will also be beneficial, by adding further familiarity with the text when analysing the data (Arksey & Knight, 1999).

3.5.2. Data analysis

Once the research data has been recorded and prepared, it can be analysed, to identify meaningful findings, in which key patterns, relationships and trends can be drawn out (Lune & Berg, 2017).

3.5.2.1. Quantitative data analysis

Quantitative analysis typically involves statistical analysis of the data, to draw out generalised findings for a research population. To aid analysis, data should be presented numerically within a spreadsheet or software package; therefore, where possible, text data (e.g., categorised/rated responses or pre-coded answers) should be assigned a numerical value to depict this (Smith, et al., 2009). For example: nominal data such as distinct categories (e.g. different construction materials) could be assigned the values: reinforced concrete (1), fired brick (2), compressed stabilised earth brick (3), and stone (4); ordinal data such as rated/ranked responses (e.g., 'not at all likely' to 'very likely') could be assigned the values 1-5, indicating their relative position within the ranking. It is important to note that large samples are required to measure significant relationships within quantitative analysis (Smith, et al., 2009); however, it is still important to consider the methods that are available, and the ways in which the data can be presented.

Quantitative data can be described using either univariate, bivariate, or multivariate analysis. Within univariate analysis, a single variable can be described, using several different methods to provide different insights (Rowley, 2014). Firstly, by calculating the number or percentage of each category within a variable (e.g., the number of reports of different material types), the frequency distribution can be found, to identify how the data is clustered (Arksey & Knight, 1999; Smith, et al., 2009; Rowley, 2014). Averages (either mean, median, or mode) can also be calculated, to measure the central tendency of the data (Rowley, 2014; Smith, et al., 2009); however, it should be noted that for ordinal data, the order of the data is important when calculating a median, and for nominal data, mode is the only applicable method that can be used (Smith, et al., 2009). Alternatively, a measure of the spread of the data can be calculated using different methods, including the range, quartiles, interquartile range, or the standard deviation; these give an indication of how dispersed the data is which can indicate a level of confidence in a given variable (Smith, et al., 2009; Rowley, 2014). This data can be presented within tables, graphs, histograms, or pie charts, depending on what gives the clearest presentation/description of the data (Arksey & Knight, 1999; Smith, et al., 2009; Rowley, 2014).

Bivariate analysis allows the comparison between two different variables: an independent, or explanatory variable, and a dependent, or outcome variable (Smith, et al., 2009; Rowley, 2014). The analysis methods available are dependent on the type of variables being considered, either categorical or continuous (numerical). For two categorical variables, as with univariate analysis, this can be calculated and presented as a contingency table, showing the frequency distribution of each of the variables (Arksey & Knight, 1999; Smith, et al., 2009; Rowley, 2014); e.g., this could show how the use of different materials differed between rural and urban locations. A categorical explanatory variable and a continuous outcome variable can be analysed using a comparison of means, typically shown within a table, or within two box plots; for this, non-parametric (or hypothesis) tests can be conducted to identify whether the outcome is due to chance occurrence or sampling procedure (Arksey & Knight, 1999; Smith, et al., 2009; Rowley, 2014). For two continuous variables, these are best represented within a scatter graph, plotting one variable on each axis, and a correlation coefficient (either Spearman Rho, or Pearson R) can be calculated to measure the relationship of the data (Arksey & Knight, 1999; Smith, et al., 2009; Rowley, 2014); however, it should be noted that to apply a Pearson R coefficient, this requires normally distributed, linear data. There may be cases in which explanatory data is continuous, while outcome data is categorical; this is unlikely, and harder to analyse, however, Smith, et al. (2009) recommend categorising the continuous data in this case.

In order to compare more than two variables, multivariate analysis could be performed, requiring more complex statistical analysis (Arksey & Knight, 1999; Smith, et al., 2009; Rowley, 2014). This analysis requires large samples to be effective, which will not be used within this study. However, there are ways to depict simple multivariate data, particularly when only comparing three or four variables which may be beneficial within this study; for example, using 3D graphs plotting three axes, or scatter graphs with scaled or coloured dots depicting additional variables.

3.5.2.2. Qualitative data analysis

There are different qualitative analysis approaches that can be used to understand qualitative data. This is typically done using a process of content analysis (Lune & Berg, 2017), which will be used within this study. This process, outlined in Figure 3-1, involves coding of the recorded text (i.e., the interview transcripts), or any other research material, in order to convert and synthesise it into manageable research data (Lune & Berg, 2017; Smith, et al., 2009; Arksey & Knight, 1999). Through this process, each segment of meaning identified within a transcript (e.g., a sentence, stanza or paragraph relating to a specific subject), is assigned a code reflecting that meaning (Arksey & Knight, 1999; Saldaña, 2013; Dey, 1993).

This process can either be done manually, or automatically using software, both presenting advantages and disadvantages. Using analysis software enables large quantities of data to be analysed in a short space of time, and allow different filters and levels of analysis to be performed (Lune & Berg, 2017); however, they can be unnecessary and inefficient for a small data set (Smith, et al., 2009). Therefore, as the number of interviews in this study is relatively small, the interview data will be analysed by applying a process of manual coding; this allows the researcher to be directly involved in establishing the codes used, and categorising the data, which can give more insightful responses, mindful of the research context (Basit, 2003). As highlighted in Figure 3-1, there are two different ways to identify the categories (or codes) by which data are sorted. These can be analytic categories (or deductive coding), which are informed and identified from initial observations within the research, or from literature and theoretical bases, providing pre-determined codes that can be applied to the data (Smith, et al., 2009; Arksey & Knight, 1999; Lune & Berg, 2017). With this is mind, it can be beneficial when conducting interviews and literature searches to keep notes of key themes and topics, that may inform these analytic categories. Grounded categories (or inductive coding) can be used to identify codes that are emergent within the data itself (i.e., identified within the transcript text) (Smith, et al., 2009; Lune & Berg, 2017).

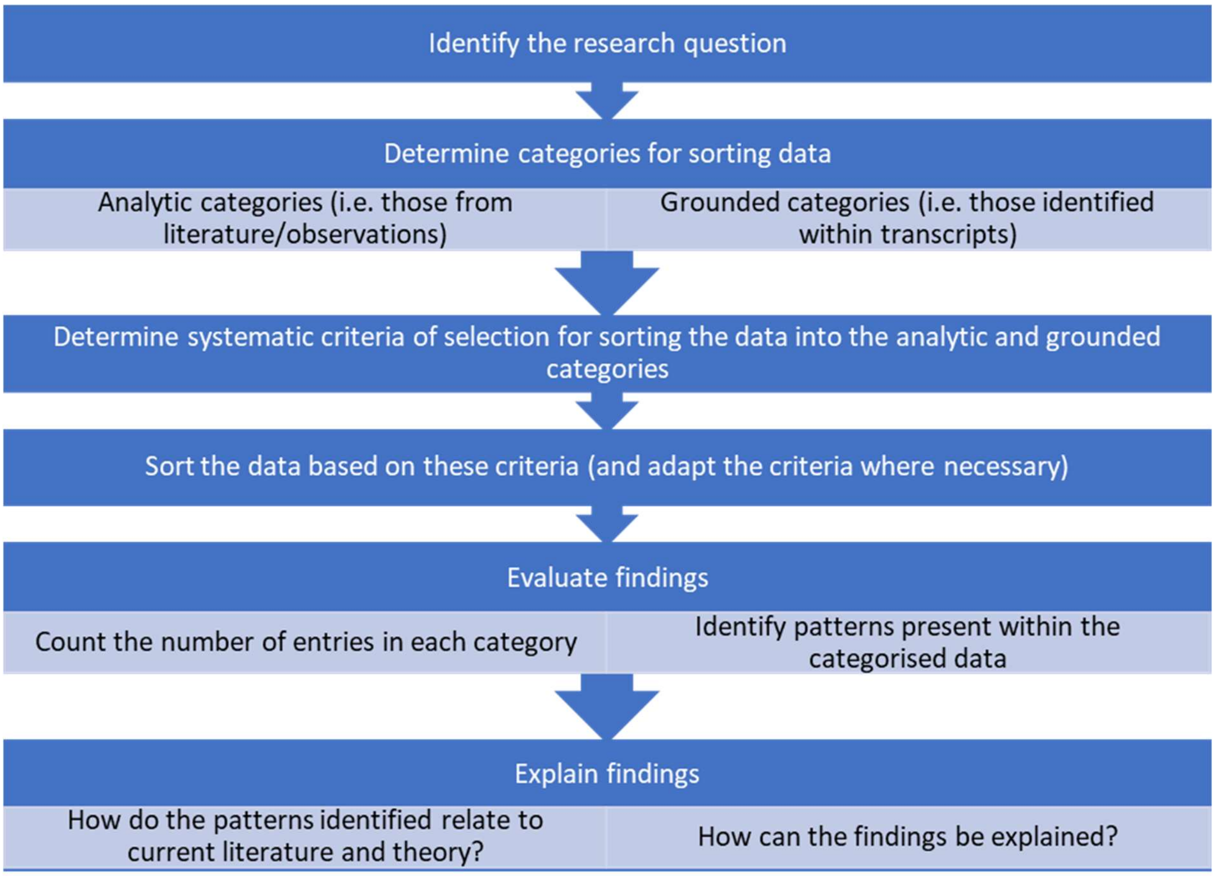

Figure 3-1 - Process of conducting quantitative content analysis. Adapted from Lune & Berg (2017).

While these approaches could be applied in isolation, it is likely that a combination of both will be used, typically starting with a small set of deductive codes on a small set of the transcripts, and identifying additional inductive codes as they emerge throughout the analysis process (Smith, et al., 2009; Arksey & Knight, 1999). This approach is also routed in 'grounded theory', first identified by Glasser and Strauss (1967); this presents an iterative method through which initial analysis (identifying a set of themes) within early transcripts informs the theory and therefore informs the direction of future data collection (Smith, et al., 2009; Arksey & Knight, 1999; Lune & Berg, 2017). As the scale of this research is small, the effectiveness of this approach would be limited, without the scope for multiple iterations of data collection and analysis. However, this does feed in to the use of a pilot study, in which key themes to identify further were identified, which were then considered within the second phase of the research.

It is important to check that the codes identified can allow for sufficient and suitable categorisation of the data. This should involve checks that: key information is not lost because it does not fit within the available codes, or that codes are too large to accurately represent the detail of the data; coding is not forcing the data to show things it is not, but accounting for, and considering the potential codes that could be used (i.e., those identified in literature); codes used and material identified actually work to answer the research questions (i.e., is the data being viewed through the correct lens (Arksey & Knight, 1999; Lune & Berg, 2017). Additionally, when developing and defining codes, it is important to have rigour in this process, with a clear/appropriate criteria for inclusion; this should enable replicability if others were to also conduct analysis on the data (e.g., there should be a clear understanding of what each code encompasses, and what content will be included) (Lune & Berg, 2017). Smith, et al. (2009) and Baptiste (2001) highlight that this should be an iterative, flexible process, in which initial judgements can be revisited, to ensure that the codes are fit for purpose, there are not multiple codes referring to the same theme, and that the number of codes is manageable.

Once the data has been coded, the data can be sorted into themes and categories, which can be interpreted and theorised, in order to gain understanding and explain the findings (Smith, et al., 2009; Lune & Berg, 2017). These processes are highlighted within steps five and six within Figure 3-1, and can be done in a number of ways. Firstly, connections between categories can be identified; this may indicate patterns and themes within the data and consider relationships between the categories (e.g., if they are of equal importance, and whether they relate to broader observations, concepts and literature) (Huberman & Miles, 1994; Lune & Berg, 2017; Smith, et al., 2009). Categories can be compared and contrasted, accounting for any similarities or differences that may appear (Huberman & Miles, 1994; Lune & Berg, 2017; Smith, et al., 2009). Categories can also be counted, identifying the number of instances a category is identified, which can enable statistical analysis to be performed, identifying how common or rare each category is (Huberman & Miles, 1994; Lune & Berg, 2017). Additionally, the occurrence of particular categories can be explored, identifying whether they are present in specific contexts, or in relation to specific topics, or whether they are common to a subgroup of participants, or to other variables (Lune & Berg, 2017; Huberman & Miles, 1994).

Content analysis could be seen as an interpretative approach for analysis, as discussed by Huberman & Miles (1994) and Lune & Berg (2017), in which patterns and practical understandings of meaning, and action can be identified. However, it is important to note that content analysis in itself cannot be used to identify causal relationships, unless the study is specifically set up for this purpose; therefore, important to acknowledge that while causality may appear likely, or be suspected, it is not guaranteed. Therefore, it is important to test this in other ways if wanting to make generalised claims as a result (Lune & Berg, 2017). Within this study, this process will be conducted within phase 3 of the research, in which the findings are validated, testing whether the identified links between challenges, good practice, and context are accurate and appropriate.

There are several other methods of qualitative data analysis available. Narrative analysis offers another interpretative approach (Huberman & Miles, 1994; Lune & Berg, 2017). This is a means of analysing the stories people use to make sense of separate events, which together create a coherent view of a situation or idea, often relating to biographical/life-history accounts (Smith, et al., 2009). This can have a focus on what is said, how it is said, the dialogue between teller and listener, and how it is enacted (Bryman, 2008). Lune & Berg (2017) highlight a close relationship between content and narrative analysis, highlighting how narrative retains a greater focus on the context of the data, while content analysis could be used to reduce data down to the individual textual elements. However, narrative analysis can have more of a basis in describing personal events and experiences building towards overarching themes, rather than describing external events and situations with many distinct elements which would be more suitable within this research. By conducting content analysis with a consideration of the contexts in which the categories and variables are identified, the benefits of narrative analysis are also available.

Discourse analysis can be used to analyse both written and spoken text, with a greater focus on what can be learned from the form and structure of the language and conversational style used (Smith, et al., 2009; Lune & Berg, 2017; Gee, 2005). This can be more beneficial when trying to identify latent meanings within data, focusing on how it is said, while this study is seeking to identify practices and actions, with a focus on the actual content that is being discussed.

Smith, et al. (2009) highlight the use of visual analysis, as a means of studying images (either sourced from others, or photographs taken by the researcher). These can be analysed and treated as data in their own right, for example by finding underlying themes within images, that can be associated with the specific context the photo was taken in. However, they can instead be used as aides-memoires, to highlight, emphasise, or demonstrate themes identified within other analyses. This approach will be more suitable within this study, given that it will not be possible to collect photographs and visual artefacts for all the schools being study, which could lead to an imbalance of data, as it will be particularly harder to conduct visits to very remote schools.

A social anthropological approach to data analysis could also be used; this identifies meaning from observations of communities or individuals, derived through spending considerable time with them in the field, for example, insight into human behaviour and actions (Huberman & Miles, 1994; Lune & Berg, 2017). However, as with visual analysis, this approach will not be applicable within this research, with limited scope to spend prolonged time with any individual or group of interest within the study.

It is important to note the potential flaws/criticisms of any method of qualitative analysis, in that, unlike quantitative methods, it is subjective, based on the analysis by the researcher (e.g., in how the data is coded, categorised etc. and the relationships that are drawn). However, as Arksey & Knight (1999) argue, it is important to consider what the research is trying to achieve, and acknowledge limitations of the methods used, while also considering the benefits of employing these methods over other research approached. In this light, it will be important to identify these within the findings of this study, for example, generalisations that can be, or have been, made, while also acknowledging the specific contextual analysis that is possible within this process.

3.6. Conclusion

This research will couple technical engineering knowledge with social science research methodologies to collate locally appropriate solutions to guide ongoing and future school reconstruction projects. This will be conducted across three phases, utilising different research methods to gain insight from stakeholders with experience of delivering school reconstruction projects in Nepal. Triangulating methods will also be used, to compensate for weaknesses of individual methods, and improve validity and reliability of findings.

Firstly, a pilot study will use structured interviews, to provide cursory insights into the broad range of factors within the school reconstruction process. Phase two will use semi-structured interviews, based on the pilot study findings, to provide qualitative, in-depth insights into key aspects of the school reconstruction process. These will be complemented by observations and unstructured meetings to provide broader insights. Phase three will validate a prototype framework produced from the research findings. Online questionnaires, conducted remotely, will provide quantitative validation, measuring the accuracy, reliability, and suitability, while also providing brief qualitative feedback.

The samples within this study will be small, due to the project scope and constraints, but these fall within recommendations for qualitative research (approximately one to 20 participants). Quantitative studies (typically with larger samples), enable generalising findings to whole populations. However, by including samples of stakeholders involved in individual case-specific schools, as well as stakeholders involved with broader school reconstruction implementation, it is possible to infer some generalisations within qualitative findings.

For qualitative data, content analysis will be most appropriate, coding responses to identify common themes. This will be supported by statistical analysis of quantitative and coded data to provide numerical measures of key data.

The subsequent chapters will provide detail on the three research phases, outlining the specific methodologies adopted, and how these have been implemented. Each chapter will then analyse the collected data and discuss how this will shape the next phase of the research.

Chapter 4:

Phase one fieldwork

Chapter 4. Phase One Fieldwork: Pilot Study

4.1. Introduction

As outlined in Chapter 3, a pilot study approach has been adopted, as the first research phase. This was conducted within a fieldwork visit to Nepal, from October 3rd to November 10th, 2017. There were two key elements of this visit: firstly, to understand the broader research context (including the earthquake impacts, resilience, recovery and disaster risk reduction efforts, and details of previous school resilience programmes); and secondly, to investigate school reconstruction projects in Nepal following the 2015 Gorkha earthquake (identifying key stakeholders, project delivery mechanisms, and the key challenges affecting projects).

Much of the visit was conducted solely by the principal researcher, although the first ten days were in conjunction with researchers from Durham University. Most of the visit was based within Kathmandu Valley, with several visits further afield, to Sindhupalchowk, Bhaktapur and Nargakot. This chapter presents the specific methodologies used, the activities conducted, the data collected and its analysis, and a discussion of the findings of this pilot study and how these feed into later phases of the research.

4.2. Approach and methodology

4.2.1. Visit aim and objectives

The field study forms the key aspect of Objective 4a of this PhD research, to conduct a phase one visit to Nepal. Through first-hand observations and conversations, this pilot study visit also provides further insight into the overall PhD objectives 1, 2, 3 (earthquake damage, school infrastructure, and seismic resilient design options), to back up and extend learning through literature, as outlined in Chapters 2 and 3 of this thesis.

The aim of this visit was to conduct a pilot study, to better understand the general context of earthquake resilience and recovery in Nepal, and identify key aspects of Nepal's school reconstruction process to be investigated in more detail in the subsequent phases of research. In order to achieve this aim, six visit objectives were established, to govern and guide the research activities and ensure the visit was successful. These were:

Objective 1 - Learn and gain experience in the practicalities of carrying out fieldwork in Nepal.

Objective 2 - Establish more contacts with stakeholders including individuals and those within organisations (such as NGOs, universities, and government bodies).

Objective 3 - See more examples of earthquake damage and impacts, through visits to rural earthquake-affected communities, and a tour of resilience efforts within Kathmandu (coordinated by Durham University research team, and NSET).

Objective 4 - Learn more about other similar research in the area, conducted by organisations in Nepal, and other PhD students on the trip, and discuss my research, to identify common links and threads of research.

Objective 5 - Carry out initial interviews at schools (practice interview techniques and working with an interpreter, get initial insight into school reconstruction projects).

Objective 6 - Carry out interviews with NGOs (practice interview techniques and working with an interpreter, get initial insight into school reconstruction projects, and the extent of damage to schools in Nepal, and the size of the recovery process).

While each of the objectives form an important part of the pilot study, providing a good general understanding of the context of the research, and improving research skills and connections to better shape the full study, objectives five and six form the key primary data collection activities; these provide the specific insights into Nepal's school reconstruction process, to better understand the organisational structure, the materials and technologies used, and the challenges affecting the process.

These objectives reflect that there is a wide range of stakeholders involved in the process of reconstructing schools in Nepal; to best understand and learn lessons from this process, it is important to balance the perspectives of all those involved. This acknowledges that while, from an engineering perspective, there is a variety of materials and construction methods that can be used to construct seismically resilient schools, the efficacy of these and overall success of projects is affected by a broad range of factors and challenges that cannot be fully understood when solely considering the engineering components.

4.2.2. Methodology

In order to achieve the visit objectives outlined above, several research methodologies have been implemented across this phase of research. As identified in Chapter 3, there are a wide range of research methodologies and tools that can be used to conduct research of this style, each with their own merits and shortcomings.

When meeting with stakeholders and actors with wider involvement in Nepal's resilience and recovery work, a format of unstructured group discussions has been employed. As this aspect of the research was mostly to gain broader insight into the context, this format was chosen to give space to participants to shape the direction of discussion and allow conversation to flow freely between all parties involved.

To complement the broader context learning from group discussions, in-person observations were used when exploring aspects of earthquake hazards and impacts, as well as recovery and resilience efforts both within Kathmandu and visits to other earthquake-affected communities. These findings were recorded through photographs taken by the primary researcher, and through a personal research logbook kept by the primary researcher.

To meet visit Objectives 5 and 6, the main focus of data collection, a one-to-one interview approach was selected. As there was the potential for negative aspects of projects to be discussed, and examples of personal experiences of the earthquake, it was felt that this was the best approach to create a safer, more private environment in order to make participants feel most comfortable disclosing their true opinions, as opposed to group approaches such as workshops or focus groups (Gill et al., 2008). This would have been particularly important for example if a group interview had been conducted with both a representative of the school, and from an organisation involved in delivering the project; as there is an imbalance of power in this scenario, it may have been difficult or uncomfortable for example for the school representative to disclose dissatisfaction with either the delivery or end result of the project, therefore limiting the accuracy and detail available within the interviews.

The interviews were conducted in line with an interview protocol established for this pilot study (provided in Appendix C). This was to ensure that the research was carried out ethically, and systematically and that the data collected was accurate and would work towards meeting the aims of the visit. This protocol outlined: 1) the purpose of the interviews, as a data collection exercise for this PhD research, to familiarise the researcher with conducting interviews, and to identify key aspects of interest within Nepal’s school reconstruction process, to be investigated in more detail in later stages of the research; 2) the participants, covering the range of stakeholders for whom the interviews are intended; 3) the topics covered within the interviews; 4) details of how the interviews would be conducted, including details of using interpreters, recording interviews, and how interviews will be introduced with participants; and 5) the research obligations, including gaining consent from participants, and the limitations of the research, ensuring that participants are aware that the interviews are not a means of providing an assessment of the quality of school reconstruction projects that are discussed.

The interviews were conducted in person, rather than remotely using phone or video conferencing tools, or online survey platforms. This face-to-face approach allowed the interviewer to interpret non-verbal clues as well as the verbal responses to questions (Ryan et al., 2009). This approach was beneficial for understanding how participants responded to different questions and aspects of the project. Also, while most participants had a good level of English, enough to conduct the interview without the need for an interpreter, these non-verbal cues provided another depth to their responses.

However, while most interviews were conducted in a one-to-one format, between the participant and interviewer, for two of the case-specific interviews it was necessary to work through an interpreter, where the language barrier would have limited conversation. This was done following guidelines set out in literature, such as those by Bragason (1997), Edwards (1998), and Murray and Wynne (Murray & Wynne, 2001). In these cases, the interviewer had gone through the questions to be asked, with the interpreter in advance, to ensure that they understood the context and flow of the interview. It should be noted that in these two cases of interviews with school representatives, the interpreter was from the organisation involved in implementing the reconstruction of the schools; however, they were not directly involved in the project delivery. This was due to the ad hoc nature of conducting fieldwork in Nepal, and it was not possible to arrange an independent interpreter to be present for the interviews. This is something that was given further consideration in subsequent fieldwork visits, in order to mitigate this being repeated. However, it does provide the benefit of having an informed interpreter, with good experience in the areas being discussed within the interview. The interpreter was given the freedom to ask clarifying questions and probe for more detail within answers directly with the interviewee, to allow more natural flow within the conversation, before providing a translation for the interviewer. This helped provide fuller answers to the questions being asked and minimised misunderstandings.

The interviews conducted within this phase of research followed a structured format. This format allows the interviewer to maintain more control over the direction of the interview, which was beneficial as the interviewer had limited experience of conducting interviews. This approach was also selected as the best way to ensure that it was possible to provide a broad coverage of all key areas of interest, and allow for direct comparison between responses (Berg, 2001). As this phase forms a pilot study, this broad coverage was important to highlight the key areas of interest that would be investigated in greater detail in subsequent phases of the research.

Most of the questions led to short, factual answers about key aspects of the reconstruction process such as the materials used, who was involved in projects, and specific impacts. This provided a good surface-level summary of the overall picture of school reconstructions many facets. However, some questions provided more opportunity to provide more detailed answers relevant to the participants experiences, and highlight aspects not directly covered in the questions. Within the interviews, in some cases, follow up questions were asked, to explore aspects of projects not covered within the base set of questions. These two features were important to identify areas that had not previously been considered and allow participants to explore areas of specific relevance to their experience, giving deeper insights into particular areas of interest.

There were two branches of interviews within this pilot study. The first was aimed at case-specific reconstructed schools, to understand the individual nature of projects and see more specific details for particular contexts; these interview participants were stakeholders involved in individual schools, such as representatives from the schools, or organisations involved in the delivery of specific projects. The second branch of interviews was aimed at stakeholders involved at a higher level, to gain a better understanding of the common challenges and experiences across many projects, and the variations between projects in different contexts.

The interview data was collected through notes made by the interviewer during the interview, along with audio recordings of the interviews, taken on a Dictaphone, which were later transcribed to provide a full written record. This worked well as it provided a dual system on which to analyse results, identifying key points raised through interview notes, and a full transcription to conduct a more detailed analysis. It should be noted that due to technology failures, two audio recordings are incomplete, so for these, the data is solely from the interviewer notes taken within the interview.

Some questions provided quantitative data, including participants giving rankings and scores to aspects of the reconstruction, and discrete answers such as project durations and construction materials. These were analysed and presented using simple statistical methods to calculate means and modal responses and display the frequency of discrete responses for example to show the most common construction materials used. This quantitative data is valuable to allow direct comparisons between individual responses and easily depict patterns and relationships within Nepal's school reconstruction process. However, due to the small numbers of interviews conducted the value of this data is limited; this serves mostly as a tool to build up a baseline understanding, and identify areas of interest to investigate further in the second phase of the research, as is intended within a pilot study.

To complement the quantitative data and provide deeper insights into the individual perspectives of participants, most of the data collected was in the form of short qualitative answers and individual narratives. A key area of interest throughout the interviews was challenges affecting school reconstruction, reported across a number of questions. Manual coding was used to analyse this data, assigning classifications to the individual narratives reported within the interviews. These primarily focused on challenges affecting the reconstruction process, and were identified based on factors identified within literature, initial observations when conducting interviews, and those that emerged when studying the transcripts. As the number of interviews was small, it was decided that completing this process manually, rather than through computer generated systems and algorithms, was most appropriate. While this is a time-consuming process, the amount of data was feasible to be processed manually and allows the coder to employ judgement on the optimum categorisations and how each narrative should be classified; as the individual narratives have an intricate and complex nature, with many interdependencies, there was flexibility within how each narrative could have been classified, so informed judgement was useful to best classify the data. The categorised narratives were then grouped together, and basic statistical analysis performed in order to identify common themes and trends within the categorised data (Dey, 1993; Basit, 2003). A count was taken of the number of instances in which a challenge category was reported, to assess the frequency of challenges faced. It is important to note that as the challenges are multi-faceted and can impact projects in numerus, distinct ways, in some cases, the same participant reported multiple challenges arising within the same category. Therefore, the results presented within this chapter are representative of the number of reports of a challenge within a challenge category, rather than the number of participants reporting challenges within that category.

Initially the responses for the case studies and wide scale interviews were analysed separately. The narratives given in the wide scale interviews presented challenges from a different perspective than those in the case studies, and therefore naturally fit into a different set of categories. This allowed for a comparison between the two sources of data, identifying common themes and key differences. In order to see the overall picture that the data provided, the wide scale interviews were then re-coded using the same categories used within the case study analysis, and an overall count was taken for each challenge category.

While not the main focus of this pilot study, the analysis of the data also highlighted some reports of examples of good practice, and measures taken to mitigate challenges and improve the delivery of school reconstruction projects. These were not analysed in detail at this stage of the research, with data only in the form of the individual narratives, as there was not consistency in reporting between all participants. However, this shows that while there are challenges affecting projects, there are means to overcome and mitigate these, which will be an important factor to consider within the next phase of research.

4.2.3. Interview schedules

Interview schedules for each of the two branches were produced, outlining the standard set of base questions to be asked to all participants, ensuring all the main areas of interest were covered. Within the case-specific interviews, these were also varied dependent on the background of the interview participant; for example, in interviews with project engineers, questions relating to the technical aspects of the project were more detailed, while school representatives were asked about impacts to the school in more detail. A full outline of each of the interview schedules is provided in Appendix D. There was some flexibility used within the interview approach, altering questions to provide clarity for participants, check clarity in responses, or ask follow-up questions on particular areas of interest.

The specific questions asked to each interview participant, along with their responses, is provided in the full interview transcripts provided in Appendix E. Using a blended research approach, the interview schedules include both quantitative and qualitative questions. While the size of the sample is small, limiting the full effectiveness of a quantitative approach, this data provides additional levels of understanding and can more clearly indicate patterns, against which the qualitative narrative data can be interpreted. This can be beneficial in identifying outlying data, as well as giving greater confidence in the narratives given.

While the wording of the questions differed between the two branches, to be relevant for the case-specific or high-level context being explored, both sets of interviews covered three overarching aspects of school reconstruction: 1) the impacts of the 2015 Gorkha earthquake on school infrastructure; 2) the specifics of reconstruction projects; and 3) the coordination of school reconstruction. Each of these areas helped to build up a better picture of how the reconstruction process works for different schools in Nepal, as well as identifying common challenges faced by multiple stakeholders within the process. It was also seen within the interviews that participants would highlight a challenge in a later question that they had not previously discussed, suggesting that if just one question relating to challenges was asked, participants may not have considered or identified all challenges. The challenges identified will be investigated further in phase two, as well as identifying good practice to overcome or mitigate them.

Within the case-specific interviews, participants were also asked about key details relating to the school, to understand the specific context of the project being considered, including: the location and accessibility of the project site; the size of the school and age range of students; and the range of school facilities available. This was not relevant within the high-level interviews, although participants were asked about how different aspects presented differently dependent on location, to similarly gain better insight into how reconstruction varied across the diverse contexts seen in Nepal. High-level participants were also asked about their role and the role of organisations they were involved in, in relation to school reconstruction, to understand the perspective and experience they represented within their answers.

The first section of questions related to the impacts of the earthquake, to understand how school infrastructure was affected, and how schools managed the aftermath. For high-level participants this focused on how effects on school infrastructure varied by location, the challenges affecting reconstructing schools, and the scale of the challenges. School representatives within case-specific interviews were asked about: specific damage caused to school buildings; the disruption caused to the school and teaching and the timescales for this; details regarding the necessity and provision of temporary facilities, including who was responsible for providing them, when they were constructed, and their suitability; and any hazards that affect school facilities. Across the two branches of interviews, these questions helped to build up a picture of the extent of the damage caused to school infrastructure, and patterns of how this occurred across the earthquake-affected districts, e.g. varying between urban and rural areas. It also gave an indication of the initial steps taken following an earthquake, and the importance of early school recovery. Within the questions it was possible to identify underlying challenges affecting the school or community, which could cause issues for the subsequent reconstruction. These questions were not asked to case-specific NGO representatives and engineers, as it was unlikely that they would have had involvement with the schools at this initial phase of recovery, although they were able to give an indication on the extent of reconstruction required, suggesting the level of damage caused.

The second set of questions focused on the specifics of the reconstruction. These questions varied dependent on the background of the participant. Within case specific interviews all participants were asked about the timescales of the reconstruction, indicating when key phases of the project occurred, including when the project was identified, confirming the design, and the start and end of the construction. All case-specific participants were also asked to identify factors that negatively affected the reconstruction process, indicating potential challenges. NGO representatives and engineers were then asked for more details relating to the specific materials and design of the reconstructed school, including seismic design features, and the provision of labour, highlighting the reasons for choosing these, as well as rating the quality of construction. This gives an indication of how material selection varies dependent on the specific context and locations of different projects, and the range of factors that are considered. There were also questions relating to the provision of TLCs if the stakeholder had been involved with that stage of work as well, to understand how these fit in with the permanent reconstruction work. As school representatives may not have been aware of the more technical aspects of the project, they were instead asked about: their involvement with the design process, including specifying facilities they required and highlighting areas where the reconstructed facilities did not meet the needs or desires of the school; and their perceived safety in the new facilities, indicating the quality construction and suitability of the facilities provided.

High-level participants were asked to give details on materials and technologies chosen for school reconstruction projects across Nepal, the factors that affect how these are selected, including how they vary with location, and their perception of how successful the current approach to reconstruction is. These questions help to identify patterns of reconstruction and use of different construction materials, and the factors that are considered when selecting suitable materials.

The final set of questions focused on project coordination and implementation. Unlike the first two sections, all case-specific participants were asked the same questions, as school and NGO representatives and engineers all have some involvement in the projects, and while their perceptions will differ, they can still offer relevant insight into the areas of interest. The questions covered the roles of individual stakeholders within the project, how the project was initiated and financed, and challenges faced at each stage of the project, from initial set up, design, construction, and any additional challenges. These questions helped to identify how individual projects are set up and coordinated, and the interactions between different stakeholders, and how this varied dependent on individual project contexts. The final question framing challenges within each stage in the process provided an opportunity to build on challenges participants may have mentioned previously and encouraged participants to identify additional challenges they had not considered or included in previous questions.

Conversely, questions for high-level participants focused on overall coordination mechanisms, and the role of the organisation they were part of, covering: how school reconstruction is coordinated across Nepal; their organization's position within the wider structure of school reconstruction in Nepal; and details of organizations both above and below them, to which they must report, or those which they coordinate and are responsible for. Across the case-specific and high-level interviews, this builds up a picture of the key actors within the organizational structure of Nepal's school reconstruction process, and the roles each stakeholder should undertake.

4.3. Conducting phase one fieldwork

The fieldwork was split into three main activities, each of which contributed to the blended research approach. In this way, data was collected through multiple sources and in different formats, allowing for greater breadth and depth of data, and enabling triangulation of findings, to measure validity and limit bias. The first ten days of the visit were conducted in conjunction with a team of researchers from Durham University, with a greater focus on the broader research context. The remainder of the trip was led independently, focusing more on school reconstruction activities, through the case-specific and high-level interviews.

4.3.1. General research activities

This fieldwork visit included a number of activities which helped to build up a better understanding of the broader research context around Nepal's school reconstruction. These activities contributed to the blended research approach used within this study, making use of multiple data collection methods (including researcher observations e.g., transect walks, photographs/digital recording, informal discussions, meetings with practitioners involved in earthquake risk and resilience work. This work is important in providing better understanding of the broader context of the research, as a stronger foundation upon which to assess the case-specific and high-level interview data.

Five days of the visit were spent in the Upper Bhotekoshi region of Sindhupalchowk, with the team of researchers from Durham University. In this time, we explored the impacts of the earthquake and landslides in rural areas, community risk and resilience work and education that had taken place in the area, and research activities that were being conducted to improve community resilience and monitor hazards. This work included conducting a transect walk to identify hazards, impacts and risk in the area, visits to two schools damaged by the earthquake and subsequent debris flows, and viewing remote sensing research being conducted using drones and landslide monitoring stations, to map and monitor hazards and risk in the region. This short visit also gave insight into the challenges of conducting research, and working in remote locations, for example with journeys delayed while excavators were being used to construct roads on the mountain sides. All of these factors helped to build up understanding of the underlying challenges affecting communities, which would also have implications for school reconstruction projects, as well as better understanding community structures and how this would affect their involvement in school reconstruction projects.

The School Earthquake Safety Programme was explored, through discussions with NSET, and by visiting the first retrofitted school in this programme, located in Bhaktapur, which was completed by NSET in 1997. This provided insight into the school resilience work that had been conducted prior to the 2015 Gorkha earthquake. As part of the Investigation, a tour, led by staff from NSET, was taken to study the earthquake resilience of Kathmandu, exploring the impacts of earthquakes, and resilience efforts in an urban setting, as well as the risks in this context. This also included visiting a school in Lalitpur, where two buildings had been retrofitted and one building was newly constructed prior to the earthquake. All three of these survived the 2015 earthquake with minimal damage, while one building that had not been retrofitted was damaged and was due to be demolished and reconstructed. This was a good opportunity to see the range of actions that may be taken to upgrade school infrastructure, as well as exploring other actions to improve school resilience, such as programmes providing earthquake awareness and safety education, and running earthquake drills.

Across the visit, with the team from Durham, and individually, meetings were held with a range of different organisations and stakeholders involved in Nepal's disaster risk reduction and earthquake recovery efforts. These included NSET (Figure 4-1), Practical Action (Figure 4-2), the International Centre for Integrated Mountain Development (ICIMOD), the Housing Recovery and Reconstruction Platform (HRRP), and academics from Tribhuvan University (Figure 4-3). These meetings included unstructured one-to-one or group discussions, presentations about their work, and tours of research facilities and resources (Figure 4-4). These provided a good overview of the broader context of how this research fitted into other research activities and programmes that were underway, working to improve the resilience of communities and infrastructure in Nepal.

Figure 4-1 - Meeting with staff from NSET, to discuss PhD research topics, and explore potential links with their work. (Source: Gopi Krishna)

Figure 4-2 - Meeting with staff from Practical Action, to discuss their ongoing work in the field of earthquake resilience (Source: Gopi Krishna)

Figure 4-3 - Meeting with academics at the Department of Geography, Tribhuvan University, to discuss their research and facilities (Source: Gopi Krishna)

Figure 4-4 - Receiving a tour of laboratories and facilities at the Department of Geography, Tribhuvan University (Source: Gopi Krishna)

4.3.2. Case-specific interviews and visits

Conducting case-specific interviews helps to identify challenges faced by individual schools during reconstruction, in the form of detailed narratives and anecdotal evidence. These challenges can then be associated with specific contexts in which they occur.

Within the pilot study, five case-specific interviews were conducted, representing five different schools being reconstructed. While the names of participants, organisations and schools involved are not included (ensuring anonymity, thus encouraging participants to speak openly about challenges faced within the projects), an overview of these is provided in Table 4-1, and the locations are shown in Figure 4-7; this highlights the individual context of each school, and the relevant experience of the stakeholder interviewed, to demonstrate the specific value each interview adds to the sample. Across the sample, a range of stakeholder narratives were gained, including representatives from schools and NGOs, including project managers and engineers. This was helpful to understand how different stakeholders perceived project delivery and challenges. Unfortunately, due to the logistical constraints of conducting the fieldwork, it was not possible to interview multiple stakeholders regarding an individual school, which would have given a more direct comparison between stakeholder perspectives; however, differences can be identified across the five interviews conducted, and this will be considered in more detail within the second phase of research.

The range of case-specific schools included provided understanding of how challenges occur in different contexts and based on different factors. The schools chosen were identified through links with NGOs participating in the study, and through individual contacts linked with individual schools, to explore more diverse projects. The five schools were selected as they provide a cross-section of locations across the earthquake-affected districts, at increasing distances from Kathmandu. There were two urban schools, in Kathmandu Valley, with one centrally, in the Lalitpur district, and one on the outskirts of Kathmandu Valley, shown in Figure 4-5. While the two schools in Kathmandu Valley were relatively easy to access, on paved roads, and accessible in a normal car, compared to western standards, they were relatively poor quality.

The three other schools were in less accessible locations, in more rural districts, accessible only on poorer quality roads, or on foot for a portion of the journey. The most accessible of these, shown in Figure 4-6, was approximately three and a half hours drive from Kathmandu, with half the journey on the main highway, and the rest on an established but poor-quality road, and easily travelled in a four-by-four vehicle. However, prior to construction there was no road within the community directly reaching the school, so a small road was constructed before the school construction began. It was not possible to visit the remaining two schools which were far less accessible, and these two interviews were conducted in Kathmandu, where these stakeholders (one NGO representative, and one engineer) were based. The first school, approximately nine hours from Kathmandu, was accessible by car or motorbike (with a slightly shorter journey time on a motorbike). However, no public vehicles, such as buses, travel to the school, with the nearest bus station a one and a half hour walk from the school, increasing reliance on personal vehicles. The furthest school was accessible by car, although only one car was available in the village. However, the school was a long way from the nearest highway, with the final roads to the village being poor quality. There were two options, either a five-hour drive on these local roads to the main highway of reasonable quality, or an alternative route which was only one and a half hours to a highway, but this highway was of much worse quality and an overall longer route, so this was a less preferred option.

Figure 4-5 - An urban school, on the outskirts of Kathmandu, reconstructed after the earthquake.

Figure 4-6 - A rural school, in the Sindhupalchowk district, reconstructed after the earthquake.

The schools differed in size, from 25 to 1100 students, affecting the number of buildings and facilities required. There were also different age ranges represented, with students from three to 17 years old, including those providing early childhood development (ECD), or kindergarten, classes, primary and secondary education, and one school which was in the process of starting higher secondary education for ages 16 and 17. This has implications for the number of classrooms and the facilities provided and can also impact on material choice. Three main construction materials were identified within the case-specific schools, using fired bricks and reinforced concrete, compressed stabilised earth bricks (CSEB), and earth bags. While this is not a comprehensive overview of all materials used, for example, schools are also constructed from stone, this gives an indication of how challenges differ based on material choice, and how material choice can vary based on different project factors.

The five schools also show variation in the mechanisms through which projects are initiated and delivered, both from government and through NGOs, as either individual projects, or as part of larger schemes of work. This presents a complex range of delivery mechanisms to be investigated in more detail in the second phase of research.

As well as conducting the interviews with project stakeholders, three of the schools (two urban and one rural) were visited, to observe the reconstruction first-hand. This particularly helped to understand and appreciate the local context of the schools. It also provided the opportunity to see and record the materials and construction methods used, as well as seeing the quality of the construction.

Table 4-1 - Overview of the five Pilot Study case specific schools

Case-specific school	Location	No. of pupils	Age range	Material	Project initiator	Participant role	Experience/insight offered
1	Urban, ~1 hr from centre (Kathmandu)	~500	7-17	Reinforced concrete and fired brick	District Education Office	School representative	Earthquake damage/impact, pre-earthquake retrofitting work, school requirements and local context, selecting labour, managing construction phase and delivery, coordinating with project partners
2	Urban, central Kathmandu Valley (Lalitpur)	~1100	3-12	Reinforced concrete and fired brick	District Education Office	School representative	History of school's pre-earthquake construction and retrofit work, Earthquake impact/damage, project initiation
3	Rural, ~9 hrs from Kathmandu (Gorkha)	~25	3-10	Compressed stabilised earth bricks	NGO (funder)	Engineer/ project lead	Design, project management (budget, construction, training), liaising with school/community
4	Rural, ~3.5 hrs from Kathmandu (Sindhupalchowk)	~60	3-10	Compressed stabilised earth bricks	NGO (funder/ project lead)	Engineer	Design/technical lead, site supervision, project management, working in local community (understanding local context)
5	Rural, ~12 hrs from Kathmandu (Ramechhapp)	~100	3-10	Earth bags	NGO (funder/ project lead)	NGO representative/ project lead	Project initiation, management and delivery, coordinating labour and volunteers, managing construction, funding

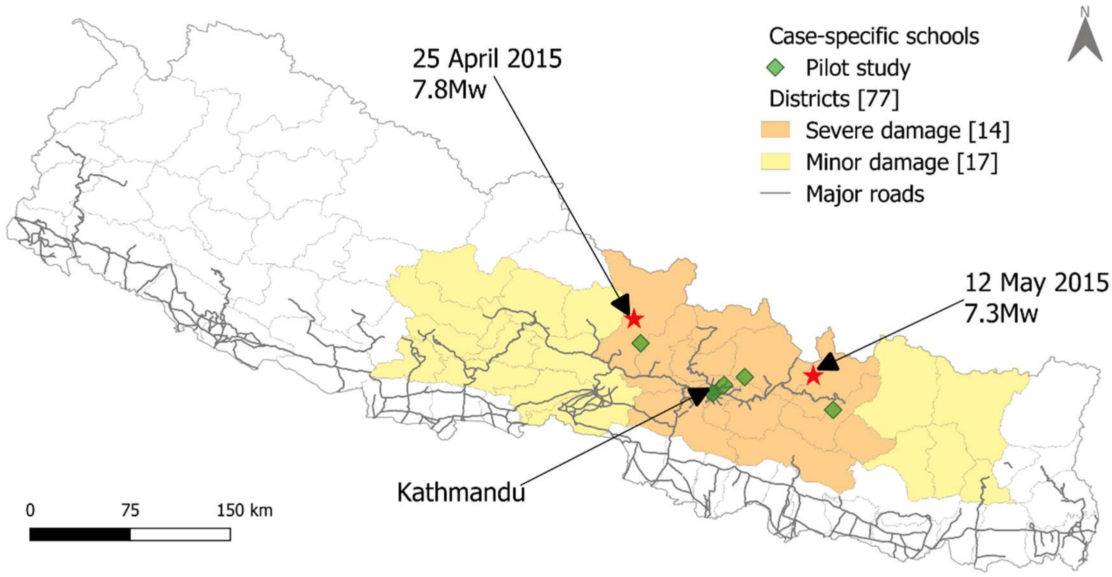

Figure 4-7 - Map showing the locations of the pilot study case-specific schools, along with the locations of the capital city, Kathmandu, and the locations of the epicentres of the April 25th, and May 12th 2015 earthquakes.

4.3.3. High-level interviews

In addition to the five case-specific interviews, interviews were conducted with five stakeholders involved in school reconstruction on a broader level. These offer perspectives of involvement with and implementing school reconstruction across multiple projects. This provides greater insight into the overarching school reconstruction process, and how challenges affected school reconstruction across the range of contexts faced.

As with the case-specific interviews, the high-level interview participants are anonymous, to give them most freedom to speak openly about the challenges and negative aspects of projects. However, Table 4- provides a summary of each participant, highlighting their role and relevant experience. This indicates the specific value each participant offers to the process, and while only a small sample in numbers, each participant offers a unique insight into the school reconstruction process, and between them cover a broad range of experience. It is important to note that all the high-level stakeholders interviewed in this phase work within NGOs, limiting the spectrum they represent, which could also introduce a bias within the results. However, each participant was selected as they were able to give detailed insight into other areas of the process, through their connections and working relationships. For example: Participant 3, in their role as a lawyer, works closely with the CLPIU-Education, with in-depth experience of the approvals process and project requirements that must be met; Participant 1, as an engineer, also offers insight into the technical requirements set by the CLPIU-Education, and working with masons on site; and Participants 4 and 5, who can provide insight into funding mechanisms, broader coordination of projects, and liaise with key stakeholders at multiple levels (such as communities, through to government bodies). This meant that across the five interviews, participants provided detailed insight into the key elements of project delivery, and from this it was possible to identify common challenges affecting the process. Importantly, across these high-level interviews, there were both similar and differing perspectives offered to those within the case-specific interviews. There were discipline overlaps within interviews with programme coordinators overseeing project delivery, and engineers overseeing technical delivery, which enabled cross referencing of similarities and differences more closely within one aspect of project delivery, which was important to monitor accuracy and reduce potential bias. However, new, and unique perspectives that were not gained within the case-specific interviews were also gathered, giving greater breadth of the study. While it would be impossible to represent the unique context of every school, across the case-specific and high-level interviews, this sample provided a comprehensive depiction of the school reconstruction process and the range of contextual factors that influence this (such as location, material, implementation mechanism and organisational involvement).

At this stage of the research, identifying the key areas to investigate further, these five participants, along with the five case-specific schools, provided a sufficient sample to fulfil the visit objectives. However, in the next phase of the research, when wanting to investigate the key areas in greater detail, it will be important to sample participants from more diverse backgrounds, such as high-level representatives from government bodies involved in school reconstruction.

Table 4-2 - Overview of the five Pilot Study high-level interview participants

Participant	Role	Experience/insight offered
1	NGO Engineer	Producing school designs, overseeing construction works and delivering training on site
2	NGO Architect	Understanding of school design requirements, designing multiple schools, and producing standard school designs to be rolled out across multiple projects
3	NGO Lawyer	Navigating and complying with the approvals process, and coordinating and communicating with government bodies

4	NGO Programme coordinator	Identifying and initiating multiple school and community reconstruction projects, establishing and coordinating funding mechanisms, and mobilising and engaging with communities
5	NGO Programme coordinator	Implementing multiple school reconstruction projects across a larger programme of work, communicating and liaising with communities and other project partners, reporting progress and coordinating with government bodies

4.4. Results and discussion

As outlined above, a wide variety of research and data collection activities were undertaken, providing both a good overview of the broader challenge of earthquake hazards and reconstruction, and the majority of the visit focussing on gathering information for Objectives 2 and 3 of the project. While there is still far more knowledge to be gained in these areas, within the phase two visit, this visit was very successful in providing a good baseline from which to work, as well as identifying further literature on these topics. The findings of this visit are detailed in the following sections.

4.4.1. Broader context

Meeting with the range of stakeholders and organisations involved in hazard and disaster resilience and recovery work, particularly during the time spent with the team from Durham University, provided a more rounded view of the issues being explored, and a better view of the wider field within which this project sits. This provided insight for Objectives 1 and 3, understanding the impact of the 2015 Gorkha earthquake, and building up a picture of typical construction practice within Nepal. Risk, resilience and reconstruction work was observed within Kathmandu Valley, particularly carrying out an ‘Earthquake Resilience’ tour of the Patan area, and a visit to Bhaktapur. This emphasised the challenges that exist within densely populated areas, with many enclosed courtyards and narrow alleys, such as the one shown in Figure 4-8, making it harder to evacuate safely. There is evidence of construction practice following previous disasters, such as that shown in Figure 4-9, in which, rather than clearing all the rubble, a new ground level has been created by building on top of this. Additionally, many buildings have been extended vertically, as shown in Figure 4-10, to provide additional accommodation, and this has often been done without adequate engineering.

However, a visit to the first SESP retrofitted school also highlighted the benefits and general success of retrofitting efforts, echoing literature findings. Additionally, this also emphasised the importance of softer approached for disaster risk reduction, particularly aiding evacuation, as well as the main technical solutions. These include: flush hinges (shown in Figure 4-11), that do not extend into door openings, that people could catch themselves on; double doors that open outwards, to make it easier to open them in a hurry; and using desks in which the bench for one is attached to the desk behind, rather than in front, so that the bars connecting them do not cause a trip hazard.

There was widespread damage caused by the earthquake, including many historic temples, such as those in Figure 4-12 in Kathmandu Valley, and Figure 4-13, in rural Sindhupalchowk. These present additional challenges, to ensure they are reconstructed sympathetically to reflect the traditional construction methods and maintain the cultural significance of these monuments.

Figure 4-8 - Narrow passageways in Patan, creating unsafe evacuation routes.

Figure 4-9 - Construction on top of debris from previous disasters, blocking exits from buildings.

Figure 4-10 - Residential buildings in Patan, extended vertically, often without suitable engineering input, and is likely to cause structural inadequacies.

Figure 4-11 - Flush hinges on a classroom door at first SESP retrofitted school. These create less obstruction in the doorway, making it easier to evacuate.

Figure 4-12 - Reconstruction of a temple in Bhaktapur, replicating traditional construction methods.

Figure 4-13 - Soft-storey failure of a temple in rural Sindhupalchowk.

The trip also included visiting villages in the Sindhupalchowk district that suffered damage from landslides and debris flows, or where monitoring work is now taking place due to the risk of potential landslides, as shown in Figure 4-14 and Figure 4-15. This gave the opportunity to explore community resilience projects and considerations. These highlighted how multiple hazards can be interlinked, such as earthquakes triggering landslides, and must therefore be considered collectively, rather than treating hazards individually. It is also important to consider how these hazards link with engineering works, and the knock-on implications these can have, for example 1) poor road construction, such as the one shown in Figure 4-16, can increase the potential for landslides, 2) landslides can destroy and block roads, preventing access to communities further along roadways, and requiring work to reconstruct them, as shown in Figure 4-17, and 3) landslide damaged roads can then cause delays to recovery and reconstruction efforts in communities further along roads, due to limited ability to transport materials and resources to project sites.

Figure 4-14 - Visiting a monitoring station in rural Sindhupalchowk, set up by Durham University. This records ground movement, in order to identify landslide hazards.

Figure 4-15 - Researchers from Durham University, using an Unmanned Aerial Vehicle (UAV) in rural Sindhupalchowk, to collect data used for landslide mapping.

Figure 4-16 - A rural road in Sindhupalchowk, cut into a soil slope face - these roads are non-engineered and are often unstable.

Figure 4-17 - A rural road under construction in rural Sindhupalchowk, using an excavator to cut the road out of the side of a slope face.

Another success of the visit was providing insight for Objective 6 of this research, identifying areas within the reconstruction process where further guidance and tools are needed and the most effective paths for implementing these. Within both the broader meetings and interviews conducted, it was highlighted that there is a need to provide greater clarity in appropriate construction practice in different contexts, identifying what materials are most suitable in different locations. It will be important to look at the role of schools as a catalyst for other construction projects in a community, something identified in several conversations as a valuable way to improve the process of building back better and safer. This was also evidenced in the visit to the first retrofitted school, where it was highlighted that other buildings in the community had later adopted similar retrofitting techniques, that had been used on the school. Conversations with organisations also identified the importance for these deliverables to be relevant and transferable to later upgrade projects across the whole of Nepal, not just in the earthquake-affected districts. As well as focussing on Nepal, there was also a strong recommendation to make these deliverables transferable to other countries, to improve the immediate response to an earthquake when looking at school reconstruction. It will therefore be important to consider the generalisations that can be made, particularly of phase two and three findings, to identify the ways in which deliverables could be applied in other contexts.

4.4.2. School damage and impacts of the earthquake

Several schools were visited throughout this fieldwork presenting a range of scenarios of how schools are affected within earthquakes. At the first SESP retrofitted school, shown in Figure 4-18, that was retrofitted prior to the earthquake, there was little damage experienced. Within urban case-specific schools, some buildings had also received retrofitting work prior to the earthquake (such as the one shown in Figure 4-19), or more recent construction (once building codes were introduced); these performed well, and damage was seen at the buildings that had not been retrofitted. Damage was more pronounced in the rural schools visited. At one school in rural Sindhupalchowk (shown in Figure 4-20), there had been significant earthquake damage, causing large in-plane cracks that has been abandoned due to earthquake; following the earthquake, there was subsequent damage caused by debris flows, burying classrooms in mud, demonstrating the impact other hazards can have on infrastructure.

A second school visited in Sindhupalchowk, in a more remote area also suffered damage, with out-of-plane failure caused by inadequate connection details, shown in Figure 4-21. At this school, there is now a TLC being used for teaching, shown in Figure 4-22, constructed from CGI sheeting, on existing building foundations. However, a community member highlighted that this school was unlikely to receive permanent reconstruction for a further five to six years, highlighting the significant delays within the reconstruction process. Other materials are also used for TLC construction, such as one observed at a rural case-specific school (shown in Figure 4-23), constructed using bamboo walling and CGI sheeting for the roof. One participant in the high-level interviews also reported that the TLCs provided are generally not fit for purpose, not providing adequate protection from the weather. This was echoed within case-specific schools, with one urban case-specific participant reporting that multiple classes had to be merged when they were unable to use the TLC. This does not affect reconstruction, but adds strain to the process, with a greater need to reconstruct quickly to minimise disruption to teaching.

Figure 4-18 - Visiting NSET's first retrofitted school, in Bhaktapur, completed in 1998, which was undamaged in the 2015 Gorkha earthquake.

Figure 4-19 - A school building at a case-specific school, retrofitted prior to the 2015 earthquake.

Figure 4-20 - A school in rural Sindhupalchowk, buried in mud, as the school sits in the path of a debris flow - a secondary effect of the 2015 Gorkha earthquake.

Figure 4-21 - Earthquake damage to a school in rural Sindhupalchowk. There was out of plane failure of the wall panels, due to poor connection to the steel frame.

Echoing findings from literature, case-specific schools also highlighted that safe buildings, and school grounds, had been used for shelter for families within the community. However, one high-level participant also reported that for schools in more remote locations, and further from municipalities, there was less support and attention from the government, particularly earlier on within the process. This highlights a need to identify approaches to assist with early recovery and reconstruction efforts, and particularly developing a more comprehensive plan to distribute efforts across all affected areas.

Figure 4-22 - A Temporary Learning Centre, providing additional learning spaces at a damaged school in rural Sindhupalchowk, constructed with CGI sheeting.

Figure 4-23 – A Temporary Learning Centre at a case-specific school in rural Sindhupalchowk, constructed with bamboo and CGI sheeting.

4.4.3. Coordination of school reconstruction projects

One of the key players in school construction in Nepal is NSET, through their work setting up the School Earthquake Safety Program (SESP), initiated in 1997, to improve school safety through retrofitting, mason training, awareness and preparedness programs. This was adopted by the government and forms the basis of the approach for many of the government school construction programs. It also sets the precedent for a more holistic approach to construction, tying in important community engagement activities for further dissemination of knowledge alongside the retrofitting or reconstruction work.

Following the 2015 Gorkha earthquake, the National Reconstruction Authority (NRA) was established in December 2015, as a government agency with responsibility to oversee and coordinate all reconstruction activities in the earthquake affected districts. For school reconstruction, it was seen that this is coordinated centrally by the Department of Education, and locally through District Education Offices (DEOs).

With regards to initiating individual school reconstruction projects, there was distinct variability seen between rural and urban schools, in how projects were identified and set up. In urban areas, projects are generally initiated by the district education office (DEO), which was true for both urban case-specific schools. One case-specific school participant reported:

> *'the DEO had put out a notice saying we are building this type of building, and then the schools had to apply, and then they selected the schools based on the need and the applications they received'.*

In this case the project was coordinated by the DEO and funded with a mix of school and government funding. The second urban case-specific school reported that the DEO had visited the school, and initiated the project following the visit, as part of a programme of twelve schools run by an NGO, funded by overseas government funding.

In contrast to this, it was seen that rural schools tend to be reliant on NGOs for initiating projects (true for all three rural case-specific schools). Generally, NGOs or social mobilisers identify schools, and projects are then funded through NGOs or volunteer fundraising. The three schools each had a different mechanism through which the project was identified and set up: one of the rural case-specific schools was implemented by an NGO, which had prior involvement in the region; the second was approached by an NGO, and the project funded by an international organisation; and the third was identified and coordinated by a group of individuals, who have since gone on to establish official NGO status, who selected a region to work in and identified a school in the area. These individuals had previously volunteered with an architect working on a similar project, and they collaborated with the same architect on this school project as well; this project was funded through private fundraising efforts and making use of volunteer labour.

These differences demonstrate that there is a complex array of implementation and funding mechanisms for schools, suggesting a disjointed approach with little coordination. One rural case-specific stakeholder stated:

“People just stumble on schools and that’s how they get rebuilt and then whichever school doesn’t get stumbled upon doesn’t get built.”

This raises concerns of how coherent and structured the overall school reconstruction process is and indicates that some schools may not receive the required reconstruction at all or in a timely manner.

As well as the initial project identification and initiation, there are a range of stakeholders involved in project delivery throughout the design and construction, with individual roles to play for different groups of stakeholders. Across the five case-specific schools, there was relative consistency of the roles taken by the different stakeholders involved. Five main stakeholders were identified and discussed: the school, the local community, NGOs, engineers, and the government (both local and national).

In general, the schools, mostly through the head teacher or the appointed SMC was often responsible for managing the project, as well as signing off on extensions required due to delays. They were also key for logistical details, responsible for providing the land and arranging provision of water and storage of materials and equipment. In most cases, the school were consulted on the design, even if it was not always possible to follow the wishes of the school due to the feasibility of the project or the budget. Where local community were heavily involved in the project in one case-specific school, the school were also the main connection through to them.

Parents were also sometimes involved in the initial discussions. For one case-specific school the village also formed a committee, which provided a channel through which the NGO could work and aided community liaison. This was done based on prior experience of challenges the NGO had facing in engaging with the community, so while the committee were paid for the role, which added costs on to the project, this move was seen as an improved step. Some of the labour for projects often came from the community, through either paid tradespeople or volunteers. One case-specific school also had many international volunteers providing labour; in this case, the local community played a key role in supporting, and providing food for volunteers.

NGOs were generally the main drivers in projects. Several projects had both a funding NGO, often international, who generally identified the projects, and then a local NGO, generally with engineering expertise, overseeing the running of the project itself. The NGO would normally be responsible for seeking the necessary government approvals. The engineers, whether within or separate to the NGOs, would generally be responsible for the design and construction, liaising with the local masons and labour, providing training and monitoring quality and signing off work. In one case, an architect, who had worked with the NGO volunteers on a previous project, completed the engineering work.

Lastly, the government's main role, particularly for the rural schools, was to grant approvals for the projects to go ahead. This went through each level from local, to district to national. For one rural school, the local government was also involved in providing the land, for which the school did not have official ownership. For the urban schools, in which the DEO had been involved in initiating the projects, or where there was international government funding, there was greater government involvement, with representatives visiting the projects, providing advice and funding.

4.4.4. Construction materials

The case-specific and high-level interviews provided good insight into the range of construction materials and technologies that are used within school reconstruction in Nepal, and how this varies dependent on the location and accessibility of projects.

Three different construction methods, or materials, were evidenced between the five case studies. The two urban schools were both constructed using the more traditional, or westernised, method of reinforced concrete frames with brick infill, shown in Figure 4-24 and Figure 4-25. With this technology, it was possible to construct a two-storey building, providing more usable space for the school, which is often desired in urban areas. This would have been a known technology for the local contractors used for the construction so little training would be needed, and the urban location mean that the transport of the materials would be relatively easy, and they could be easily sourced from suppliers in Kathmandu. Fired bricks are easily sourced within Kathmandu and the short distances on higher quality main roads present less risk of damage to the bricks during transportation.

Figure 4-24 - RC frame and fired brick infill wall school, constructed in Kathmandu.

Figure 4-25 - A fired brick school building, constructed in the outskirts of Kathmandu.

The rural schools used other technologies, principally reported because transporting the materials for the RC and brick design would be impractical, particularly as the fired bricks would be prone to breaking on the poor-quality roads to the schools. However, high-level participants did report the use of fired bricks and reinforced concrete in rural settings, so there is not a clear divide between urban and rural contexts.

One alternative technology used in the rural case-specific schools was compressed stabilised earth bricks (CSEB), shown in Figure 4-26, for which government approval has been granted. This technology involves locally producing the interlocking bricks, shown in Figure 4-27, from locally sourced sand and soil, with a low ratio of cement. These bricks can be air-dried so there is no need to fire them. Two of the case study schools used this technology. Local brick making factories were set up in the local communities, in order to provide the materials. For one of the schools this was established for the school reconstruction project, while for the other, CSEB technology had already been established in the village, so it was an optimum choice of material, as the brick-making infrastructure and training was already in place.

Participants reported that the brick and panel tests they conducted showed comparable compressive strength and seismic resistance between CSEB and traditional fired bricks and RC frame. As highlighted in Chapter 2, CSEB is also an accepted technology within Nepal; it is included within government produced type-designs for housing and although not currently included in school type-designs, CSEB is approved for school reconstruction. One case-specific school reported that it can be economical, and the best low-cost material for seismic resistance; they highlighted that the school wanted an RC frame design, but it was economically unfeasible (due to location and road quality) so CSEB was chosen instead. It was also reported that it is a fast form of construction, as evidenced in the timescales. Many Nepali's have a desire to have construction that replicates the styles used within Kathmandu, as a sign of prosperity and strength. CSEB fulfils this desire for many people, as one participant reported:

"If it is three to four hours up a dirt road, and they can't afford the fired brick ones, they are like '[CSEB] is just amazing, we can rebuild the house at half the cost, and it looks just like brick and it's really strong'."

The final school used earth bag technology, a construction practice using bags filled on site using local sand and soil, to form the walls, strengthened using bands of barbed wire to bond levels and tie walls together. The bags are very easy to transport and most other materials can be sourced very locally. Unlike with CSEB, there is no need to establish a local factory for production, which could decrease set-up time of projects. It is also a cheap form of construction and can produce very aesthetic buildings.

Figure 4-26 - RC frame with CSEB infill wall, in rural Sindhupalchowk.

Figure 4-27 - A pile of CSEB bricks, to be used in a local house construction.

It is also important to note that, despite being used in one of the case-specific schools, and in other school reconstruction projects, earth bags typically are not approved by the government for school reconstruction, due to concerns over reliability and safety. This raises concerns over the adequacy and diligence within the approvals and checking processes, which may lead to sub-standard quality of construction.

There are also a number of other possible alternative materials that could have been used. It was reported that stone was a main construction material at higher altitudes and very remote locations. One high-level participant reported that while their organisation was not involved in actual construction in stone, they supported local tradespeople in using stone-cutting technology; it was highlighted that this can reduce delays and duration of construction, by speeding up the labour-intensive process, and also improve the quality of stones used within the construction. It was not possible to identify any case-specific schools using these during this visit, which could be addressed in the phase two study. Steel frames have also been identified as a potential construction material within literature (De Luca, et al., 2019), and were witnessed at a damaged building (discussed in Section 4.4.2) but were not used in any case-specific schools.

There are a number of factors affecting the suitability of materials, as one participant reported:

> *"a bit higher up, stone is very cheap and easily available, so people there would rather build with stone, so feasibility is a deciding factor as well".*

As mentioned, these factors may include cost, availability of materials, altitude, public perceptions, and access to skilled labour and knowledge of working with those materials. Understanding the details of these different factors that affect school reconstruction will be important to include within the aims for future visits to provide greater depth to the study. This will allow more appropriate guidance to be produced, ensuring that design options are feasible to implement. De Luca, et al. (2019), also highlight how the proportions of different construction typologies will vary over time, particularly in the earthquake affected areas, as particular typologies are more frequently adopted for reconstruction.

4.4.5. Project timescales

Another aspect investigated in the interviews was the timescales of school reconstruction projects, identifying how this varies dependent on a number of factors. This was possible for the three completed schools, one urban and two rural, and the results are shown in Figure 4-28. Estimates were also given for one of the two unfinished schools, anticipating the full project taking five months, with construction lasting four months; however, as these were estimates, this has not been included in the results, as unforeseen delays can have a significant impact on project timescales.

As expected, each project had a small delay between projects initially being identified and agreed, before construction work commenced. For two of the schools, this period of agreeing the design and preparing the project took three months, while in the third school this period took only half a month. This shorter time is likely due to the fact that the design for this school was recycled from a previous school, so less work was required to put this in place. The estimates for the currently unfinished school also set this initial period at only one month, and again, this project was also reusing a design from a previous project.

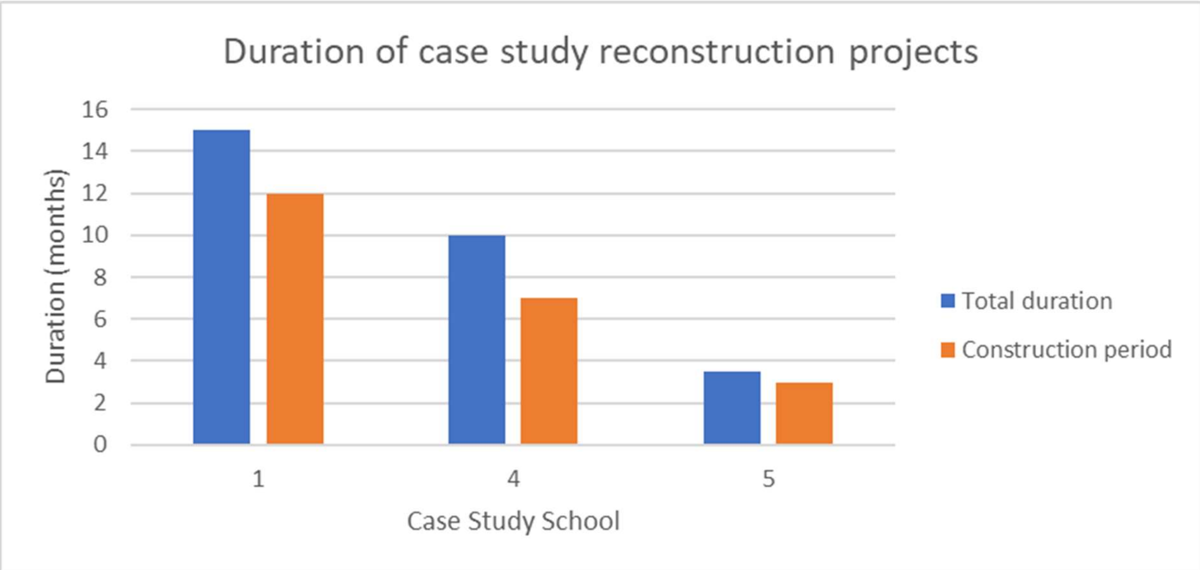

Figure 4-28 - Chart showing the duration (in months) of reconstruction projects for the three completed schools, shown as the total duration, from project initiation to completion, and the construction period, from when construction work began through to completion of construction work. Note: for one of the unfinished projects, the total duration is estimated to be 5 months, and the construction period 4 months.

Unexpectedly, one of the two urban case-specific schools had the longest duration. It could be expected that as accessibility is easier, and local contractors are used, which should mean a more experienced team of labourers, construction should be quicker. However, there are some reasons why this was the case. As discussed later, there were issues with the contractors which may have induced some of these delays. The building provided was also much bigger, constructing a two-storey building with more classrooms, which would naturally take longer to construct. It may also be that the more traditional construction approach used, of an RC frame and brick infill, takes longer to construct than the CSEB and earth bag technologies used in the other projects. This was highlighted by an interview participant, reporting that CSEB provided a shorter construction span than other materials.

The earthbag school had the shortest duration, in terms of both total duration and the construction period at. The estimated durations for the unfinished CSEB school are only slightly longer than this, while to completed CSEB school took several months more than this. While they use the same technology, it may be that the estimates are overoptimistic, and delays may increase the time, or a number of other factors may have an effect. The projects were run by different organisations who may have different procedures to follow, locational factors or the size of the workforce available all may increase times.

4.4.6. Labour

Of the five schools studied, the two urban schools reported hiring contractors for construction, whereas the rural schools often used local labourers (as shown in Figure 4-29), with a mix of local community volunteers, employing some local skilled tradespeople, and in some cases, international volunteers. Training for labourers, particularly in rural contexts, was reported, both for volunteers and employed tradespeople. This may be in specific construction practice, or in the case of CSEB, a brick press, shown in Figure 4-30, may be set up in the community, and community members and local entrepreneurs may be trained to produce the bricks locally. This allows entrepreneurs to continue with this technology beyond receiving support from the NGO involved, training more local people with construction skills.

Figure 4-29 - Local labourers constructing a CSEB house in rural Sindhupalchowk. CSEB was also used to construct the village school, sharing the skills learnt.

Figure 4-30 - A local brick-making factory in rural Sindhupalchowk. Entrepreneurs receive training in producing CSEB bricks, to be used in construction.

The labourers for one rural project had already received some training using the chosen CSEB technology on previous reconstruction projects in the area. More training was required on the job, especially as the previous training relating to housing construction, not schools. While there was a base level of knowledge already in place, when asked about the skill of the labourers, one participant assessed them as:

"Not much capable….I had to guide them, make corrections."

The other rural CSEB school required full training, but this was planned in as part of the project, with one NGO staff member present on site at all times to oversee the project, and an NGO engineer delivering specific on the job training at key stages of the reconstruction, such as foundations, sill and lintel levels, and the roof. The third rural school, constructed with earth bags, hired a few skilled labourers such as a carpenter and a plasterer to complete the more technical aspects. Generally, their work was good, although there were issues with technical details and quality of finishes, as one participant reported:

"Sometimes you have to guide a little bit, for the details. Because we are used to, you know, details have to be perfect, but for them it's not that perfect."

Apart from the specific skilled trades, the labourers were mostly international volunteers. The project was advertised in hostels in Kathmandu and Pokhara. Volunteers would join the project at different times, for just a couple of weeks, up to the full duration of the project. These were generally unskilled volunteers, mostly just providing manual labour. These volunteers did receive some training and guidance from the architect on the project and some of the NGO volunteers with previous experience on other projects. These volunteers would then pass on this knowledge to new volunteers, and in general, volunteers would work on the parts of the project where they were most comfortable.

4.4.7. Challenges

All participants were asked to comment on any challenges affecting the reconstruction of schools following the earthquake. Challenges were categorised into common themes; these themes were evident within the interview transcripts, although were also informed by literature and initial observations when conducting the fieldwork study. To compare the results, a count was taken of the number of reports of each challenge. This is the total number of reports, rather than the number of participants that reported each challenge, as some participants may have experienced multiple individual challenges related to one challenge category.

Initially case-specific and high-level interview data were considered separately, as the challenges naturally grouped slightly differently, due to the different perspectives and experiences presented. These results are shown in Figure 4-31 for case-specific, and Figure 4-32 for high-level. Within the separate analyses, the different challenge categories encompass the different challenges, dependent on how they were emphasised by interviewees; for example, in the case-specific analysis, the materials category includes issues relating to transporting materials, and the availability of materials, and considers labour availability within a separate category, whilst in the high-level analysis, the availability of materials was typically presented as an issue of the supply/demand gap due to the extent of reconstruction (also encompassing the availability of labour), while transporting materials is included within the topography/transportation challenge.

This presented a complex set of results to analyse. Therefore, in order to more directly compare the results between the two groups, the case-specific and high-level interviews were then considered together, categorising the individual challenge narratives from all interviews using a common set of challenge categories across both levels. As with the initial analysis, the categories were identified through those evident within the transcripts, alongside initial insights from literature and field observations. The results of this are presented in Figure 4-33, showing the total number of reports in each category, as well as how this was divided between case-specific and high-level interviews. It is important to note that this is not a comprehensive list of all challenges affecting Nepal's school reconstruction, but rather provides an insight based on the experiences of the stakeholders interviewed. By combining the case-specific and high-level participant responses, six common challenge categories were identified: 1) accessibility and transportation, 2) the quality and availability of materials, 3) the skill and availability of labour, 4) the government process, 5) the suitability and availability of land, and 6) community involvement.

Table 4-3 provides a summary of the challenges included within each of the six categories. It is clear from Figure 4-31, Figure 4-32, and Figure 4-33 that there are some similarities in the responses between case-specific and high-level participants. However, there were also variations, in both the challenges reported, and the level of reporting, by the two groups. These variations, as well as a more in-depth study into the six key challenges identified in this pilot study, will be investigated in phase two. It is important to understand how these perspectives and experiences differ between the different stakeholder groups. If challenges are viewed differently within individual schools, versus at a high-level (when coordinating multiple projects), this will impact on how resources are allocated, and may lead to the views of different groups being underappreciated and therefore inadequately planned for.

As Figure 4-33 shows, there are discrepancies between the frequency of challenge reports by high-level and case specific interview participants; for example, only high-level participants reported challenges relating to the government process, whereas most reports of challenges relating to accessibility and transportation, community involvement and land availability were from case-specific participants. While, in part, these may be explained by the particular experiences of the interview participants, it was important to investigate these differences further, and to understand the relative impact of the challenges in more detail.

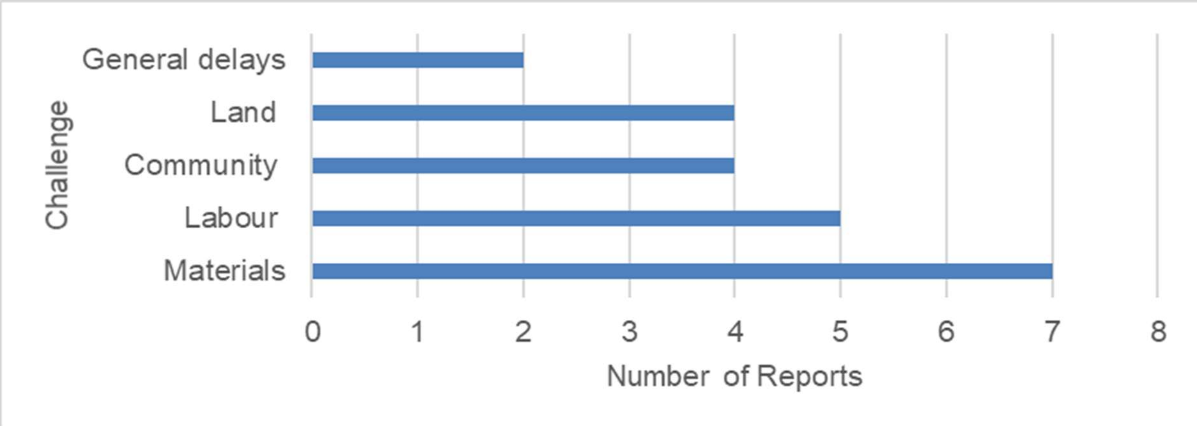

Figure 4-31 - Reported challenges for case-specific schools. These have been grouped into the five main categories shown, so may reflect a number of reports of challenges in the same category, from an individual case study school.

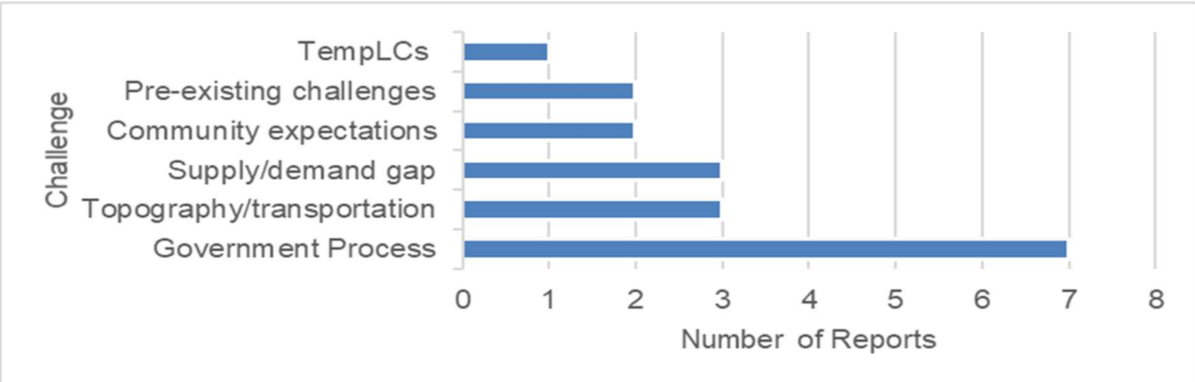

Figure 4-32 - Challenges affecting school reconstruction in Nepal, reported within high-level interviews. The values represent the number of reports of challenges within a category, rather than the number of participants reporting that challenge.

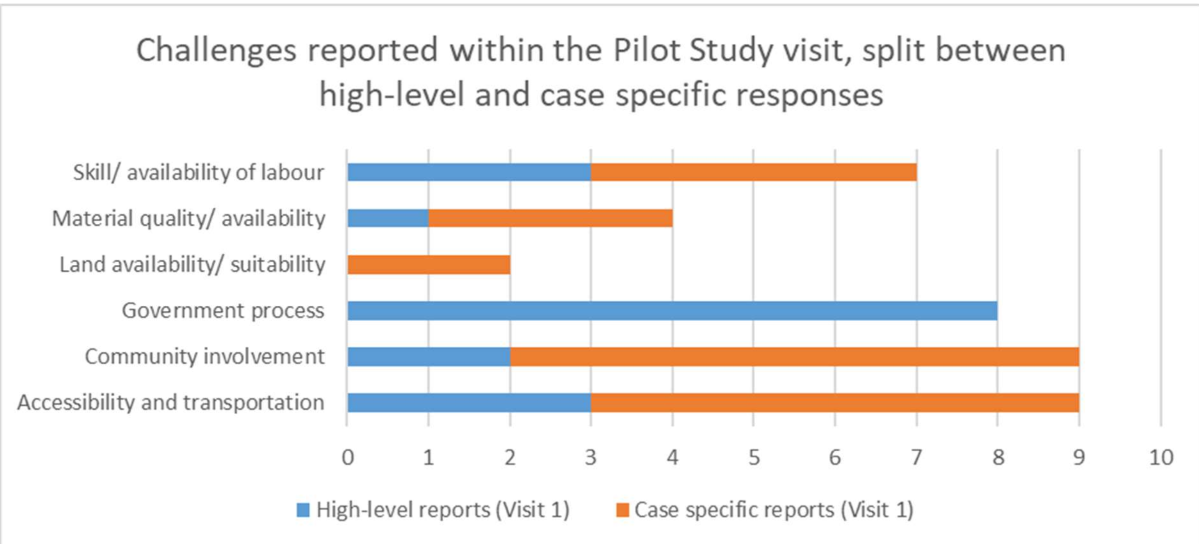

Figure 4-33 - Challenges reported within the pilot study interviews, by high-level and case specific participants, split into the six common challenges to be investigated further in phase two. The values represent individual reports of each challenge.

Table 4-3 – Overview of the types of issues encompassed within each of the six challenge classes shown in Figure 4-33.

Challenge	Types of issues covered
Quality/ availability of materials	Supply/demand gap due to extent of reconstruction work required, cost of materials increased, unsuitable materials chosen, incompatible materials (e.g., CGI sheeting) from different manufacturers.
Skill/ availability of labour	Supply/demand gap due to extent of reconstruction work required, cost of labour increased, disputes with contractors, contractors leaving projects early, lack of skilled labour, quality of construction due to poor labour (required more supervision and correction).
Community involvement	Balancing budget with community expectations, not fulfilling community/school needs within the design, miscommunication between NGO and community, managing disputes with the community, lack of community engagement within the process.
Suitability/ availability of land	Limited access to suitable water source on/near sites (expensive/hard to overcome if not available), disputes over land ownership.
Accessibility and transportation	Transporting materials difficult (particularly in hilly/mountainous terrain), poor quality roads (exacerbated during monsoon), delays and increased costs of transportation, site access within communities, limited vehicles available for transporting materials, lots of the affected areas were rural and remote.
Government processes	Corruption and bureaucracy, slow and complex approvals process (from multiple levels), lack of suitable temporary facilities provided, lack of coordination and management from upper levels.

4.4.7.1. Accessibility and transportation

Accessibility was one of the most frequently reported challenges; although there were reports within both high-level and case-specific interviews, it was more frequently reported by case-specific participants, with six out of nine individual reports, within four of the five schools. It is often very difficult to transport materials over long distances, and on difficult terrains, particularly following the earthquake and monsoon season when landslides are common, blocking the roads, as shown in Figure 4-34. This can lead to delays, and increased costs, particularly when there are limited transport options available; one rural project reported that only one vehicle was available in the community that could be used to transport materials, so the driver of the vehicle began to vastly increase the price to use the vehicle, driving up costs further, and another case-specific participant reported:

> *"The hauling the materials should be all from a long distance as there is no local market near to it, and that gives problems, that creates problems for transportation, for bringing materials in and everything, it increases cost in that way I guess."*

This was also echoed within the high-level interviews, with challenges relating to Nepal's mountainous topography. These challenges included difficult terrain and poor-quality roads affecting accessibility and transportation. This can affect the suitability of certain materials, dependent on the location of the school, for example fired bricks can be prone to damage if transported on poor-quality roads. For schools that are difficult to access it can also affect how easily training and supervision is provided, which may affect the quality of the construction.

Figure 4-34 - Reconstructing a road that had buried in a landslide, blocking transport routes. Landslides caused by the monsoon can cut off many roads each year.

4.4.7.2. Community involvement

The other most frequently reported challenge was relating to community, and similarly to accessibility, had higher levels of reporting within the case-specific interviews, with seven out of nine reports. This included balancing school or community expectations and desires with the budget for the project and what is feasible to achieve. These were generally around agreeing the number of classrooms that would be built, the material used, or other facilities to be included such as reconstructing compound walls. In one case, this was due to miscommunication as the funding NGO agreed different things with the school and the NGO controlling the reconstruction, which required more work to sort out when agreeing the design.

For schools, reconstruction is an opportunity to build schools with more classrooms and other facilities, using higher quality materials. This feeds in well to implementing a Build Back Better approach, although within the limited scope of projects, this is not always possible. One project also reported that they were disappointed as they wanted to have more interaction with the community during the project, which was not possible. It is concerning that this challenge was reported more frequently within case-specific interviews; while it could be expected that this challenge would be more evident within individual projects, it suggests that the importance of effective community involvement is underappreciated at a high-level when coordinating multiple projects. This could limit the consideration this is given, and therefore limiting how suitable the facilities provided are, and ensuring that the community is engaged and has a sense of ownership within the projects.

4.4.7.3. Government processes

The third most frequently reported challenge, with eight individual reports, was challenges relating to government processes for school reconstruction. Conversely to accessibility and community involvement, these reports solely from high-level participants, with four out of five high-level participants reporting this as a challenge. Participants reported a lack of coordination and management, and a slow and confusing approvals process, which can cause significant delays. This lack of coordination can be seen in the sporadic nature of how reconstruction projects are assigned across the affected districts and a lack of coherence in the approach to project delivery. The increased focus on the government process is to be expected when investigating the overall reconstruction process, as these challenges have a much clearer impact when looking at the broader scale. While it may be difficult to implement significant changes to improve or affect the government process, it will be important to consider when producing frameworks and guidance in later stages of the research, as this presents a large constraint in which projects must work. It also raises concerns that the impact this can have within individual projects may be underappreciated, and therefore not acknowledged within individual project delivery. This could be particularly challenging for projects run in isolation, and not part of a broader scheme of work, such as the fifth case-specific school.

4.4.7.4. Skill and availability of labour

Three case-specific reconstruction projects had been completed, while at the other two schools, construction work had not begun, so they were unable to comment on any challenges pertaining to the labour aspect of construction. All three completed schools reported challenges with the quality of the labour force on the project; this may suggest that this challenge may be underrepresented within the results, if it were likely that labour would have presented a challenge within the remaining two case-specific schools. The labour was poor quality, with even when previous training had been provided, or these were semi-skilled or employed labourers, such as carpenters, masons, or plasterers, additional training was needed, or corrections were needed on work completed. One participant commented:

"We are used to, you know, details have to be perfect, but for them it's not that perfect."

There was also one report highlighting the shortage of labourers and masons due to the high demand, leading to increased costs, which was also highlighted in the interviews with several staff involved in school reconstruction more generally. As one participant reported:

> *"the reconstruction work from the earthquake not only for the schools, I am not talking about schools, but I am talking about the whole reconstruction – due to that, the cost of masons and labourers has gone totally insane….we have to pay much more, like double the government rate"*

One urban school reported that there were issues with the first contractors selected, leaving the project one month into the reconstruction, leaving the School Management Committee needing to find another team of contractors. They reported that this was a common issue on many projects.

4.4.7.5. Quality and availability of materials

The fifth challenge category includes challenges relating to materials. Similar to the issue of a shortage of labourers, a shortage of construction materials was reported, due to the large amount of reconstruction work taking place across all sectors. It was reported that this caused increased costs of materials, as they were in higher demand. At one case-specific school, it was also reported that the nearest source of water, an important resource for construction, was one and a half hours walk away, so this presented a large challenge to reconstruction.

The other aspect of material challenges were two reports of unsuitability of materials - both challenges coming from one rural school. One challenge was the incompatible corrugated roofing materials from different suppliers, with different suppliers producing different shaped corrugations. The second challenge involved needing to change from the original scheme using natural plaster – a mixture of dung, hay and mud – as this was not drying during the monsoon rains. This therefore had to be substituted at a later stage for cement plaster.

Linking with the challenge of accessibility and transportation, and also highlighted during the complementary research activities, it is important to consider where and how materials are sourced, and the challenges this presents. This is an area requiring further investigation, however, it was reported that some materials must be transported from Kathmandu, while others can be provided from closer suppliers. It was also observed that some materials may be sourced locally, such as the collection of sand and gravel from a river, as shown in Figure 4-35, or through using local timber. This can be a good means to utilise local resources, however, it presents a challenge to ensure this is done sustainably, and does not cause negative consequences through deforestation or excessive river dredging, and the associated hazards such as landslides or flooding.

Figure 4-35 - Trucks transporting sand and gravel collected from a river, to be used as construction materials. This may be transported to Kathmandu, or to surrounding local villages, on poor quality roads.

4.4.7.6. Suitability and availability of land

The final challenge category, least frequently reported, with only two reports, both from case-specific participants, were challenges relating to land. These covered issues over land ownership and access rights – one school needed to construct a road up to the site of the school in order to transport materials, but there were questions over who owned the land the road would be constructed on, which caused significant delays. There was also one report of unsuitable ground conditions limiting where the school could be built, shown in Figure 4-36, and one report of the placement of the building being less than ideal:

“One small problem was one classroom was too cold, it didn’t get enough sunshine.”

It is important that high-level participants also consider this when coordinating and delivering projects, in order to reduce the potential delays and increased costs that may be incurred because of these challenges.

As shown in the case-specific data in Figure 4-31, many of the challenges discussed above will have caused delays in their own right. However, one school project specifically highlighted delays as a challenge. They reported that the monsoon arriving earlier than expected caused delays, as well as reporting other general delays throughout the project, requiring the team to be flexible with the timings of the construction work. Along similar lines, within the high-level data shown in Figure 4-32, pre-existing challenges were highlighted as a distinct challenge category affecting school reconstruction; one participant reported that many villages could not afford to construct before the earthquake, so are struggling now to cover costs of reconstruction. While there is little that can be done to overcome these pre-existing conditions, it is important to consider them, as they can still present major barriers to the successful delivery of projects. While it may have been expected to see pre-existing challenges highlighted within case-specific interviews, these challenges may have been encompassed by the post-earthquake challenges, particularly when focusing on the reconstruction project.

Figure 4-36 - A staircase at an urban school. The school wanted this constructed at the rear of the building, but due to poor land quality this was not possible.

While levels of reporting differed, for most challenge categories for the combined data, there are reports of similar challenges within the case studies and wide scale interviews, helping to validate data and demonstrate that conditions experienced in individual case studies can be, to some extent, generalised for a broader area. This is particularly important when looking to produce guidance that would be applicable on a wide scale.

4.4.8. Good practice

Along with well as utilising school reconstruction projects to provide wider benefits to schools and communities, there are a number of practices that were identified that worked to improve project delivery and mitigate or overcome potential challenges. This was not a specific focus of this pilot study but will be an area to be investigated further within the phase two study.

Mitigating actions to overcome a challenge before it occurs are important in aiding the smooth delivery of projects. Firstly, for one rural school, it was acknowledged that although there were several problems, all were overcome. Similarly, no school reported challenges that completely prevented work from going ahead or continuing. There was also one report highlighting mitigating actions to overcome a challenge before it presented itself, by ensuring that all materials were transported to site before the monsoon hit, which could have limited access to the school and impeded deliveries to the school.

One urban school reported that the School Management Committee (SMC) was involved in the project, which was very helpful, and also that the design was easy to construct.

While not relating to the reconstruction project, one urban school reported that during a previous retrofitting project at the school, the timing of this had been coordinated with school terms, in order to reduce disruption to classes, and some classes were combined for short periods, while some rooms were unavailable. Although some challenges may be slightly different, this is a scheme that could be considered in future reconstruction projects, replicating this successful approach.

Positive aspects of the designs were also raised. One school reported that the reconstruction project provided a good opportunity to improve facilities for the school, providing office space and a staff room. A participant in the wide scale interviews reported improvements in accessibility for disabled children too, highlighting reconstruction projects that provided school facilities for children with hearing impairments and installing ramps and railings to improve wheelchair access.

There was also evidence of good use of materials. Selecting reinforced concrete and fired bricks within Kathmandu is a sensible choice, with which it is possible to construct the larger buildings often required within more populated areas. While there are challenges of using these materials in rural areas, within Kathmandu the materials are easy to access and transport. It is a common form of construction in Kathmandu, and therefore contractors are more familiar with it, so require less training.

Participants also praised the use of compressed stabilised earth bricks (CSEB) for school construction. It was reported that in rural areas this can be a much cheaper form of construction, while providing an equivalent strength to that of fired bricks and reinforced concrete. One case study participant reported that CSEB was selected as it had already been used in other reconstruction work in the community. Therefore, the infrastructure required to produce the bricks locally was already in place, and labourers had already received some training in constructing with this material. This approach is something that should be considered for ongoing reconstruction work, looking to create hubs of knowledge, skills and infrastructure using appropriate materials. This could help to spread the use of these materials to surrounding areas, which could improve the efficiency of the overall process of school reconstruction in Nepal.

These examples of good practice demonstrate that there is scope for wide scale improvements in the school reconstruction process, and a capability to deliver projects successfully. However, good practice is limited, and there was little evidence of this knowledge being shared and transferred between projects. As previously discussed, the lack of appreciation of challenges at an individual project scale suggest that there is more to be done to assist in this knowledge transfer of good practice between stakeholders involved at different levels of the process.

4.4.9. Wider benefits of school reconstruction

As well as improving the quality and delivery of school reconstruction projects, some of the good practice also leads to additional benefits, for both the school and community. These feed into Build Back Better efforts, in line with the Sendai Framework.

Meeting with the staff involved in the SESP and visiting several NSET schools provided a good overview and background of the program, identifying the achievements, the challenges faced, and how the program, and NSETs work has evolved since the inception and now following the earthquake. During the visit three NSET schools were visited: the first retrofitted school (shown in Figure 4-18), another retrofitted prior to the earthquake, and one reconstructed after the earthquake. These visits were useful to show the progression of these projects, the variation in technologies used, and additions such as the inclusion of accessible ramps in the reconstructed school. As discussed in Section 4.4.1, it is also important not to overlook softer design features to improve earthquake preparedness and safety: doors opening outwards, with hinges flush against the wall, and open benches, all of which aid evacuation.

Another school also highlighted that the reconstruction project provided a good opportunity to provide more facilities for the school, such as an office space and a staff room. One participant reported improvements in accessibility too:

> *"various things were kept in mind, like making it disabled friendly, so five of those schools are schools for the deaf, and also students were in a wheelchair, so buildings were made with a ramp, and railings".*

One such ramp is shown in Figure 4-37. These facilities were not in place before the earthquake, and this has improved the overall quality of the school and the ability for children with disabilities to access education.

As had been evidenced following retrofitting projects prior to the 2015 earthquake, there were also examples of technology transfer between schools and other infrastructure, such as housing. This provides an opportunity to introduce new materials and technologies into communities, improving the quality and resilience of construction. It is also possible to utilise training across multiple projects, equipping and developing skills among local tradespeople. This was implemented for one rural case-specific school, which was part of a larger CSEB construction project throughout the village, involving the school and multiple houses (such as the one shown in Figure 4-38).

Figure 4-37 - An accessible ramp constructed at an urban school in the outskirts of Kathmandu.

Figure 4-38 - A CSEB house within the same rural village as a CSEB case-specific school.

4.5. Consideration for phase two research

The pilot study provided good initial insight into Nepal's school reconstruction process, meeting the visit objectives and making good progress towards the PhD objectives. However, several key areas needing further investigation were identified; these will be used to shape the focus of the phase two study. Additionally, while familiar with the cultural and logistical implications of working in Nepal prior to this phase, the pilot study provided insight into the research practice used; this will be considered when planning and conducting phase two research activities.

4.5.1. Areas to investigate

The research so far has identified that there are a range of challenges affecting school reconstruction, in both urban and rural locations. However, it has been found that the challenges are greater in rural areas, and there is more scope to identify and implement mechanisms for improvements in this setting. Therefore, the phase two research will have a greater focus on rural school reconstruction. This will consider the six key challenges identified in the pilot study: 1) accessibility and transportation, 2) community involvement, 3) government processes, 4), skill and availability of labour, 5) availability and suitability of materials, 6) suitability of land. The phase two interviews will explore the relative impacts of these challenges, including the effect they have on projects, and how they are perceived by different stakeholders.

Alongside this, phase two interviews will investigate good practices to mitigate and overcome the six challenges. This will assist with knowledge transfer between stakeholders. Some challenges, such as those associated with the approvals process, are systemic and would require significant changes to remove the problems; however, it is hoped that some good practice can be identified that works to better navigate these challenges and reduce the subsequent impacts.

Materials have been identified as a key challenge to reconstruction, with issues of availability, quality and transportation. However, more clarity is needed about why particular materials and technologies have been selected for specific projects, considering: how suitable they are for that context; where materials are sourced from (e.g., transported from Kathmandu, local markets, or locally available materials e.g., sand and gravel); and how this impacts the project. Within the phase two study, it will also be important to gain further clarification on the coordination and implementation of school reconstruction projects. This will include exploring the process of how projects are initiated; and the opportunities to link projects with organisations with prior experience of appropriate materials and working in that context. Additionally, as schools are well placed to implement wider benefits of reconstruction projects, the phase two interviews will explore how these can be maximised, utilising schools as a catalyse within communities.

4.5.2. Considerations for research methodology

As well as highlighting areas for further investigation, the pilot study provided experience of conducting research in Nepal, which will shape the research methods used in the phase two study. The dual level of interviews, with high-level and case-specific stakeholders, was successful and will be continued in the next phase. It was not possible to visit all the pilot study case-specific schools, but the visits that were conducted provided further insight to complement the participant responses (e.g., through observing the construction and site constraints). Therefore, within phase two, it would be beneficial to conduct more case-specific school visits; however, it is acknowledged that with a greater focus on rural reconstruction, this will present logistical challenges, which should be considered when planning activities.

While there were a range of challenges identified in the pilot study, some participants (particularly school representatives) were less willing to discuss these, focussing more on the positives and the benefits of reconstruction. Often, challenges were also seen as the norm, and therefore not noteworthy, as one participant commented:

> "basically everything was a challenge, yeah, everything was a challenge, but everything works out".

This must be considered when conducting interviews in phase two, ensuring that participants are assured of confidentiality to disclose information, and that the interviews are not a means to judge or assess the quality of projects. This will also be considered when designing phase two interview schedules, with multiple opportunities for participants to identify and discuss challenges, including framing these questions in a more positive light, such as identifying potential improvements. Within the pilot study interviews, several scalar questions were used, asking participants to numerically rate aspects of projects (e.g., from one to five). However, this was often ineffective, with participants not responding, or responses not reflecting qualitative answers given. Within phase two, questions using a categorical scale (e.g., 'perfect', 'good', 'satisfactory', 'poor') may be more suitable, with clearer meaning and greater consistency between participants.

Due to logistical challenges in the pilot study, within two case-specific interviews with school representatives, the interpreter was a staff member from an NGO involved in the reconstruction. This appeared not to impede participants, as they still disclosed some challenges within the projects; however, for the phase two study, it will be beneficial to work through an independent interpreter, to reduce the potential for interpreter bias or influence. It will therefore be important to brief the interpreter, particularly outlining the purpose and content of the interview, ensuring they understand the intention of each question.

Within the pilot study, interviews were conducted with stakeholders from a range of backgrounds. However, it was not possible to interview or meet with any representatives from government bodies (e.g., within the NRA or CLPIU-Education). This is something that would be beneficial within phase two interviews, providing greater insight into the coordination and regulatory procedures in place, and perceived challenges and successes of the overall school reconstruction process. Access to these stakeholders is likely to be limited, but it may be possible to work through existing contacts to establish a link to representatives within these bodies.

4.6. Conclusion

The pilot study has been successful, providing initial insight into Nepal's school reconstruction, and the broader context. This chapter presents data collected within structured interviews with five case-specific and five high-level school reconstruction stakeholders in Nepal, supported by observations and meetings with other stakeholders.

Six key challenges affecting school reconstruction were identified: 1) accessibility and transportation, 2) government processes, 3) community involvement, 4) suitability and availability of materials, 5) skill and availability of labour, and 6) suitability of land. The two stakeholder groups reported challenges differently. This will be investigated further in phase two, to understand how perspectives differ, the effects and relative impact of different challenges, and the contexts in which they occur. While challenges were reported for urban areas, they are greater in rural areas, with more scope to effectively reduce these; therefore, the phase two study will focus primarily on rural school reconstruction.

A range of materials were reported within school reconstruction, including fired bricks and reinforced concrete, CSEB, earth bags, and stone. No single material is suitable for all of Nepal and phase two will investigate how the suitability of each material varies in different contexts. Earth bags were used within one case-specific school; however, this material does not have government approval, raising concerns of a lack of control and monitoring. Different mechanisms to initiate projects were also reported (including formal government bidding processes, individual NGOs approaching schools, or schools approaching NGOs), suggesting a lack of coherence within the process. These factors will be investigated further in phase two.

This visit also highlighted the multiple interlinked hazards affecting Nepal, exacerbated by difficult topography and historic construction trends. All these hazards must be considered, alongside implementing community resilience approaches, in order to reduce risks affecting schools. This phase also identified several items of good practice that could work towards BBB efforts. This indicates that it is possible to reduce challenges and improve the quality and efficacy of reconstruction. Phase two will investigate suitable good practice actions that can be implemented in specific contexts. The next chapter will detail the work conducted within the phase two study. This will include: the aim (based on pilot study findings); the methodology used, and research activities conducted; and discussion of the research findings.

Chapter 5:

Phase two fieldwork

Chapter 5. Phase Two Fieldwork

5.1. Introduction

The previous chapter highlighted the findings of the pilot study, identifying three key areas for further investigation. These include: 1) understanding how projects are coordinated, initiated, and delivered; 2) understanding the impact of the six key challenges identified; and 3) identifying good practice to overcome or mitigate the challenges identified, working towards building back better and safer schools. These aspects will also inform which materials are most suitable in different project contexts.

These aspects of Nepal's school reconstruction process have been investigated in phase two of this research, within a second fieldwork visit to Nepal. The visit was conducted from 29th September to 6th November 2018, with the majority of the time spent in Kathmandu, as well as a short visit to Sindhupalchowk and Dolakha districts to visit case-specific schools. This chapter details the methodology used within this phase and the research activities conducted, as well as presenting the findings and results. It concludes by highlighting how these findings will feed into the third phase of research, producing a prototype decision-making framework.

5.2. Approach and methodology

5.2.1. Visit aim and objectives

To address the gaps and further knowledge to be developed, that were identified within the pilot study, a second fieldwork visit was undertaken. The aim of this visit was:

To collect primary data in the form of interviews and case study narratives, that would develop understanding of the suitability of different construction materials, the impact of challenges affecting the process, and good school reconstruction practice to mitigate these challenges.

To achieve this aim, the visit had the following objectives:

Objective 1 - Visit case study schools to gain better understanding of the context of the reconstruction.

Objective 2 - Conduct 'case study' interviews with relevant stakeholders (school representatives, NGO representatives, engineers, project managers) to collect narratives about individual school reconstruction projects.

Objective 3 - Conduct 'wide scale' interviews with relevant stakeholders (NGO representatives, government representatives) to collect narratives about wide scale school reconstruction efforts.

Objective 4 - Meet with experts (I/NGO representatives, aid agencies, academics) in relevant fields to gain insight into specific areas of interest.

Objective 5 - Build relationships with participants and relevant stakeholders, to identify and secure possible routes for implementation of the outputs of the research.

The scope of the first visit was broad, focussing on school reconstruction across all the affected districts, comparing rural and urban locations. Through the first visit, it was identified that while there are challenges affecting all locations, schools in rural areas outside of Kathmandu were more susceptible to challenges than those in urban locations. Therefore, the scope of this research has been narrowed for this second fieldwork visit, to focus primarily on rural areas. As the first visit was covering both rural and urban locations, it was only possible to see a limited depiction of the context of rural Nepal. This second fieldwork visit aimed to develop a more comprehensive picture of reconstruction across the broad range of rural contexts, covering a range of levels of access to suitable road infrastructure, altitude, and access to resources.

5.2.2. Methodology

As with the pilot study, this phase of research utilises social science research methodologies in order to collect primary data, interviewing case-specific and high-level stakeholders in Nepal's school reconstruction process. This approach has been selected as it provides perspectives from those involved in school reconstruction, with experience of living and working within the context of rural Nepal, where the research is focussed. This is particularly important as it ensures that guidance and best practice identified are relevant to this context, giving credibility to the deliverables produced. Observing and evaluating purely from an outsider perspective would risk missing out on key factors and considerations which help to give context and understanding to the way school reconstruction projects are set up and delivered.

Within the pilot study, a structured interview approach was used, to gain surface level insight into a broad range of factors, to identify key areas of interest to investigate further. While there would have been advantages of many of the different interview styles, a semi-structured interview style was selected for this second phase of research. It was important to allow participants to have space to discuss at more length their perspectives, in order to gain greater depth of insights provided, which a structured interview style would restrict. The semi-structured approach also gave more freedom to ask follow up questions for clarification of responses, particularly important due to language and cultural differences, and differing levels of experience of interviewees, or ask for more detail about a subject raised, away from the main interview schedule. However, there was a large number of subject areas of interest, requiring a number of more rigid questions, which would be less suitable to an unstructured approach. In this context, the semi-structured approach also provides a good balance of control between interviewer and interviewee, giving freedom for the interviewee to discuss issues of concern and areas of importance to them, but also allowing the interviewer to maintain the overall direction of questions to ensure that the responses are relevant to the key focuses of the study (Berg, 2001). This is particularly important to ensure that the key areas of interest (identified within the pilot study) are covered, but also allows space to discuss and explore other areas of interest specific to individual contexts where these are particularly relevant.

Similarly to the Phase 1 visit, the interviews were generally conducted with participants in a face to face, one to one setting, to provide a more personal, private environment; this was to encourage participants to share more negative views of projects and challenges more freely than if others were present, in a group interview setting. It also allows for a more conversational style of questioning to be adopted, between interviewer and interviewee, which may be harder to establish when trying to hear the views of several interviewees. This allows more depth and clarification of answers, providing richer detail of one perspective. In three cases, an interpreter was also present, although, having highlighted this in Phase 1, this interpreter was independent to study, and had no link to any of the participants, to reduce the likelihood of bias in responses. The interviews were also conducted in line with an interview protocol produced, provided in Appendix C, which outlined how interviews should be recorded, how to work with interpreters, and the obligations of the researcher, such as gaining the necessary permissions to conduct the interviews.

The schedules were also replicated in an online platform, as an online questionnaire, to reach participants it was not possible to meet with in person, which was important due to the geographical and time constraints of the field study (Van Selm & Jankowski, 2006). While this does not allow as much scope for participants to expand on answers, the balance of succinct qualitative and quantitative questions still provided a valuable response. To try to reach more stakeholders, this questionnaire was also translated into Nepali, however, there were no responses through this version; the likely users of the Nepali questionnaire would have been school representatives, who it is harder to access and contact initially to gain their involvement, so this is likely to be the reason why this method was unsuccessful.

It was highlighted in the pilot study that it would be beneficial to interview multiple stakeholders involved in individual case-specific schools. However, as was also seen in the pilot study this was not possible within this phase, due to the logistical difficulties of visiting schools, and the challenge of engineers and NGO staff moving on to other organisations and roles, and therefore being difficult to follow up. It was hoped that the online questionnaires would help to reach these multiple stakeholders; unfortunately, this was still not possible. However, the high-level and case-specific interviews and questionnaire still provided a broad range of perspectives and settings to give a good understanding of school reconstruction in many varied contexts. As most of the data collected is qualitative, the number of responses required is small, as the individual narratives provide valuable findings. Additionally, within this phase, the snowball effect was utilised more successfully, with interview and meeting participants identifying and initiating contact with other stakeholders. This could introduce bias, with potentially narrow channels and similar views expressed between participants identified this way. However, it also meant it was possible to interview more stakeholders that it would have been difficult to access individually, such as government representatives and those in larger, more established organisations, who hold significant voices. Bias was limited by meeting with participants individually, and separately to those who had initially established contact, to reduce the likelihood of mirroring or tailoring responses between participants.

To complement the interviews, meetings were also conducted with experts in specific areas of interest relevant to school reconstruction. These meetings took the form of unstructured discussions, rather than taking an interviewer-led form, to allow conversation to flow more naturally. While the interviews were recorded using an audio recorder and later transcribed to ensure an accurate account in participants words, these meetings were recorded solely through interviewer notes made within the interview. This approach was selected to reduce the formality of these meetings to encourage more natural flow of conversation; as these meetings were aimed more at providing insight into particular areas such as technical engineering knowledge, rather than directly feed into research findings and main data analysis, it was also less important to record participants words directly.

While the full details of interview questions are covered in Section 5.2.3, within the high-level and case-specific interviews, to quantify the relative impact of each of the challenges, participants were asked to rate each of the six challenges as either 'no challenge', a 'minor challenge', or a 'major challenge' for the affect they had on school reconstruction. To analyse this data, these responses were assigned values of zero, 0.5 and one respectively, in order to identify mean and modal scores for each challenge, to easier compare and rank them. Participants were also asked to give details on how the challenges affect projects, such as effects on cost, time, and quality of construction. While most participants used the precise wordings of 'no challenge', 'minor challenge' or 'major challenge' within their response, some participants, despite encouragement, did not use these wordings, although did provide narrative descriptions of the challenges. In these cases, a judgement has been made by the researcher on the scale of each challenge, based upon the descriptions given by the interviewee; this was deemed a better option than to disrupt or stall the overall flow of the interview, particularly where clear distinctions were still made within the narratives offered. Some participants also highlighted the variation in the level of impact in different contexts, and in these cases, both levels were recorded and considered within the analysis, typically using an average of the reported levels, to best represent the relative challenges across Nepal.

Alongside this, the Phase 2 data was analysed using manual coding to categorise the individual challenge narratives into the six pre-determined challenge categories that were identified in the pilot study, to group the relevant data together (Dey, 1993; Basit, 2003). Participants were asked specifically about the challenges in one section of the interview, although challenge narratives highlighted elsewhere in the interviews were also included. A similar process of manual coding was used for the reported good practice, to group similar practices together, to determine how frequently and how broadly different good practices were implemented. To assist with this process, some questions had been assigned a range of pre-coded answers that participants might select, identified from initial findings in the pilot study; these pre-coded answers were not shown to participants, so that this did not influence their responses, but made it easier to record and code responses within the analysis.

For each participant's responses, a process of cross-referencing was then used to link challenges identified with the associated good practices reported that had been implemented to overcome or mitigate them, and the relevant contexts in which they had been applied. These reports were then collated and grouped based upon common sub-challenges and similar items of good practice, in order to create a catalogue of good practice, and the associated contexts in which they would be suitable. This catalogue can then be used in future work to inform the creation of a decision-making framework, that could be used to identify appropriate good practice that could be implemented within a school reconstruction project, based upon known contextual information for the school.

5.2.3. Interview schedules

There were two branches of interviews conducted, with a separate interview schedule for case-specific and high-level participants, provided in Appendix F. However, while the questions are worded differently, across the two schedules, the questions cover the same aspects of school reconstruction, just focused on either individual school level, or broader school reconstruction. This allows more direct comparison between the results from the two sets of participants. The intention of the interview schedule is that questions will be asked, as written, to all participants. However, the semi-structured nature of the interviews gives freedom to be flexible with this, missing out or altering questions if that would be more appropriate experience for specific participants (Berg, 2001), for example reducing technical questions for school representatives if it is clear they have little knowledge in this area; this helps ensure participants feel comfortable within the interview, and are able to answer most questions asked. The specific questions asked to each participant, along with their responses, is shown in the phase two interview transcripts, provided in Appendix G. The interview questions and topics have also been arranged to build up rapport and conversation between interviewer and participant, and putting the participant at ease throughout the interview, starting with shorter factual answers, before moving to questions with more in-depth, personal perspectives.

The interviews aimed to provide insight into five key areas of interest that were highlighted within the pilot study: 1) the contexts explored within the interviews; 2) the coordination and implementation mechanisms for school reconstruction projects, and the roles each stakeholder should play; 3) details of the reconstruction; 4) how different challenges affect reconstruction projects, including the relative impact of each challenge, and the contexts in which the challenges occur; and 5) the good practice that has been implemented to overcome or mitigate the challenges, or provide additional benefits to school reconstruction projects, and the contexts in which they would be appropriate.

To begin the interviews, questions were asked relating to the context and area of experience of the participant. For case-specific interviews, these focused on the details of the school (including the location and size of the school, the facilities available at the school, and the impact caused to the school and community by the 2015 earthquakes). These questions were chosen first as they are simple to answer, requiring relatively factual responses, building to the more emotive impacts caused. This helped to set the tone of the interview, and ease participants into answering questions. Questions at the end of the case-specific interviews circled back to the context of the project, this time looking in more detail at the accessibility of the site, other hazards, and the role of, and impact for, the community in which the school is situated. These questions were chosen for the end of the interview, rather than directly after the initial context questions, so that there was more time to build rapport throughout the interview, meaning participants were more comfortable providing more detailed responses to these more integral questions. These questions also were likely to highlight more positive aspects of the reconstruction, ending the interview with a positive rather than negative tone. For the high-level interviews, specific school context could not be identified, but in order to understand the particular areas of expertise and experience of the participant, the first interview questions focused on the participant's role and responsibilities, the role and focus of the organisation, and when the organisation had been established, to identify participants who could address how the approach to construction differed pre- and post-earthquake. This helped to understand the baseline conditions, and broader contexts in which their projects sat, and the contexts covered by their responses; where this was not clear within their answers, further clarification was sought, to ensure that the broader generalisations made about specific contexts were accurate. High-level participants were also asked to discuss the broader impacts to school infrastructure caused by the earthquake, and how this varied between urban and rural areas, and in comparison to other sectors.

The second set of questions focused on the coordination and implementation mechanisms for projects, seeking clarity on the broad range of approaches seen within the pilot study. Similarly to the initial contextual questions, these questions require more factual, rather than personal responses, which may require participants feeling more comfortable within the interview setting. For high-level participants, these questions focused on the broader coordination, identifying who is responsible for coordinating school reconstruction, the process of identifying and initiating projects, the funding mechanisms in place, and any links to, or differences between, reconstruction in other sectors. For these, participants were asked to highlight if, or how, these varied depending on urban or rural contexts. For the case-specific interviews, these questions focussed on the specific coordination of the project, including: the timeline for construction (to highlight phases that experienced delays); how the school was identified, and the project initiated and funded; and the role each of the key stakeholders played in the reconstruction (including the school/SMC, NGOs, engineers, labourers, government, community, and any others).

Thirdly, participants were asked about specific details of the reconstruction. These questions begin to bridge the gap between more factual and personal responses, building on the previous questions asked. Participants were asked about the materials and design used within the construction. For the high-level interviews, participants were asked to highlight the different materials used across Nepal, indicating the specific contexts in which each were suitable, or commonly adopted to build up a picture of the feasibility and constraints of implementing the different materials within projects. Participants were then asked to discuss the decision-making process, indicating how specific materials and designs were chosen, and the experience of those involved in that process. Finally, participants were asked to discuss the government requirements in place in order for approval to be granted for construction, to highlight areas of discrepancies between reported practice and regulations. For the case-specific interviews, participants were asked about the specific materials and design selected for the school, including seismic-resistant and other design features. They were also asked to indicate the reasons for selecting these and the decision-making process (including who was involved in that process), and other options that were considered. Case-specific participants were also asked to highlight any improvements that had been made to the original facilities, and areas that were not possible to be addressed within the reconstruction; this gave an indication of the ‘build back better’ potential for projects, as well as giving preliminary insight into some of the challenges that may have been faced, which acted as barriers to implementing the desired improvements.

Within the fourth set of questions participants were asked specifically about the six challenges identified within the first visit, in order to better understand the impact these challenges have upon projects. They were asked to rate these as either 'no challenge', a 'minor challenge', or a 'major challenge', in order to understand the relative impact of each of these challenges. These discrete ratings were selected, as opposed to a numerical scale, e.g. one to five, as they give a clearer definition of each level, increasing the reliability of responses between all participants (Alwin & Krosnick, 1991). Within the analysis, to quantify the relative impact of each of the challenges, participants' responses of challenges as 'no challenge', a 'minor challenge', or a 'major challenge' were assigned values of zero, 0.5 and one respectively, in order to identify mean and modal scores for each challenge, to compare and rank them. Participants were also asked to give details on how the challenges affect projects, such as effects on cost, time, and quality of construction. For case-specific participants, these questions related to the challenges specifically affecting the individual school considered, while for high-level participants, this focussed on broader school reconstruction in Nepal, although when participants highlighted that the challenges varied by context, further clarification was sought on how these differed, and the different ways these presented in specific contexts.

This section was chosen to fall later within the interview, as this was one of the key areas of interest, where there was most scope for participants to provide more in-depth responses; by working through the previous questions, participants had time to become more comfortable with the interview setting, in order that they were more likely to divulge more detail within their answers in this section, providing greater insight into the challenges. It was also possible that participants would have highlighted challenging aspects within the previous sections, relating to the coordination and design; this aids the interviewer in ensuring that the responses to the challenge questions were thorough and gave a comprehensive assessment of all the challenges experienced.

The final set of questions (aside from the more in-depth contextual questions discussed previously), focused on the good practice. By putting these questions towards the end of the interview, it helps shift the tone towards more positive achievements and elements of the reconstruction, rather than ending on the challenges, presenting reconstruction in a negative light. This also ensured that there was a more comprehensive assessment of all the relevant good practice, as the interviewer now had a full overview of the reconstruction and associated challenges. Similarly to the challenges, as this section was towards the end of the interview, participants were also more likely to provide more in-depth, thorough responses to these questions. Participants were asked to discuss any actions that had been, or could be taken to overcome or reduce any of the challenges highlighted. For case-specific participants, this related to good practice that had been implemented within the project, while for high-level participants this related to good practice implemented more generally within school reconstruction, highlighting the contexts in which these would be suitable. For both sets of interviews, participants were also asked about any changes they would make to the reconstruction, in order to improve it; this was to encourage participants to highlight additional items of good practice that they may not have previously mentioned, or actions that had not been implemented within the projects considered in the interview, but may have been used in other contexts.

5.3. Conducting phase two fieldwork

This second fieldwork visit conducted from September 29th – November 6th 2018, comprised of a range of activities. These activities included visits to case-specific schools, conducting case-specific interviews, conducting wide scale interviews, and meeting with experts in specific fields of interest. These activities were used to collect a range of primary data, including case study and wide scale school reconstruction stakeholder narratives, personal observations and photographs, and expert narratives and insight for specific subjects. These activities also provided some secondary data, such as school design drawings and damage databases, provided by participants.

5.3.1. Case-specific schools

There were six case specific schools considered in this phase two study, shown in Figure 5-1, with further detail provided in

Table 5-1, indicating basic context of the school, and experience and role of the stakeholder interviewed.

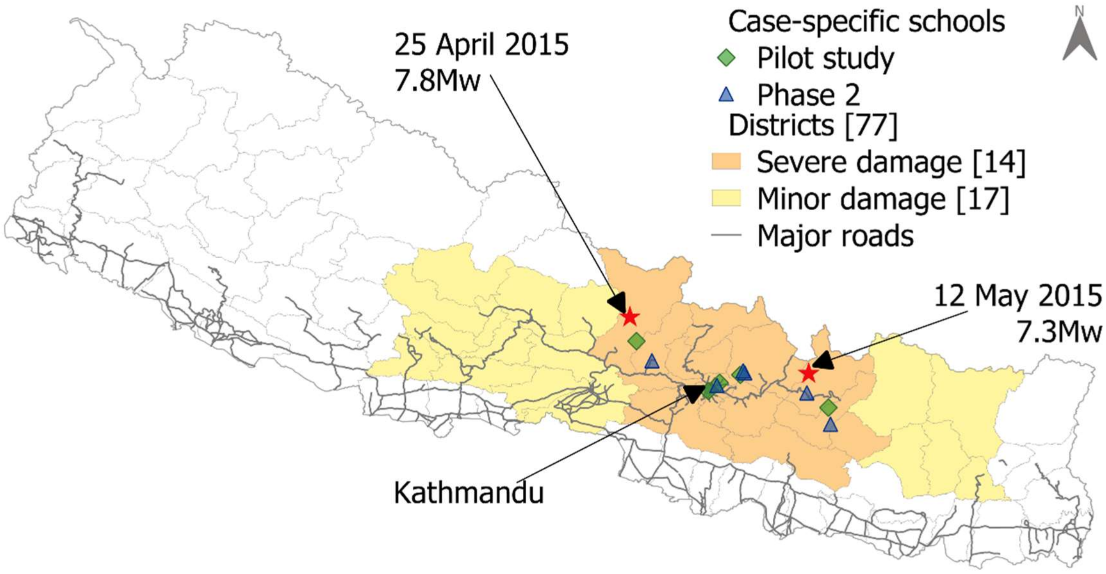

Figure 5-1 - Map showing the location of the six phase two case-specific schools (along with the pilot study case-specific schools for reference), and the locations of the capital city, Kathmandu, and the epicentres of the April 25th, and May 12th 2015 earthquakes.

Having identified in the pilot study that challenges were greater in rural areas, the main focus of case-specific schools were outside of Kathmandu, although one urban case-specific school, in the outskirts of Kathmandu Valley was included in the phase two study, for comparison. Unfortunately, due to the practical constraints of conducting fieldwork, the case-specific schools in this phase offered a limited range of construction materials, using only reinforced concrete and either fired brick or stone. This is indicative of the pattern of material use across Nepal, in which other construction materials are more commonly used in more remote locations, which are harder to access. While it was hoped to get a broader spread of materials within these case-specific interviews, to better understand the specific challenges, insights into other construction materials, such as timber, steel, and CSEB are still provided within the high-level interviews and in meetings with other stakeholders involved in broader aspects of reconstruction.

Of these six schools, five were covered within in-person interviews with stakeholders from the schools. Of these, four (three rural and one urban) were conducted during visits to the schools, with representatives from the schools, either the headteacher, assistant headteacher, or members of the School Management Committee. The visits each lasted approximately two hours, including the interview, lasting between 30 and 45 minutes, and a tour of the facilities and the grounds, outlining the extent of the damage caused by the earthquake, and site constraints, as well as highlighting aspects of the reconstruction and recovery work, such as temporary learning facilities, completed reconstruction work, and planned future work.

Table 5-1 - Overview of the six phase two case-specific schools

Case Study	Location	No. of pupils	Material	Participant role	Experience/insight offered
1	Urban, ~1hr from centre (Kathmandu)	~600	Reinforced concrete and fired brick	Head teacher	Earthquake damage and impact, school requirements and local context, project initiation, coordinating with government, NGO, contractor and engineer, future reconstruction plans,
2	Rural, ~4 hrs from Kathmandu (Sindhupalchowk)	~110	Reinforced concrete and fired brick	Head teacher	Rescue and aid distribution, earthquake damage, purchasing materials, managing project delivery and construction, understanding school requirements and local context
3	Rural, ~3.5 hrs from Kathmandu (Sindhupalchowk)	~800	Reinforced concrete and fired brick	Assistant head teacher	History of previous construction and retrofit work at the school, future construction plans, impact of earthquake, school requirements and local context, construction phase
4	Rural, ~6.5 hrs from Kathmandu (Dolakha)	~60	Reinforced concrete and fired brick	School Management Committee member	Earthquake damage and impact, history of the school and school requirements, knowledge of local context, project initiation, coordinating with government, NGO, community/school, and contractor, managing project delivery
5	Rural, ~4 hrs from Kathmandu (Dhading)	~80	Reinforced concrete and fired brick	Project Manager	Overseen reconstruction of three schools, worked with the schools before and immediately after the earthquake, navigating the approvals process, funding, liaising with school/community, engineer, contractor and government, supervising project delivery (budget, programme of work)
6 (Online)	Rural, ~8 hrs from Kathmandu (Ramechhapp)	~90	Reinforced concrete and stone	Construction Manager, in NGO	Project managed reconstruction of two schools, NGO already worked in the village with other educational programmes, funding, broader community engagement and training

The first visit was to a school on the outskirts of Kathmandu, approximately an hour car journey from the centre of Kathmandu. This visit was accompanied by a representative from the partner NGO, who set up the meeting and wished to see the progress of the construction, and they sat in on the interview with the school representative. It was hoped that this could be avoided following the first visit, in order to minimise potential bias or sway in participants responses, due to potential power dynamics. However, in this case it was not feasible to prevent this, and the participant still responded openly to questions, with both positive and negative aspects, and the NGO representative took a minimal role in conversations.

The contacts for the remaining three visits were established through the partner NGOs, but the visits were conducted independently, accompanied by an independent, local interpreter. The same interpreter was used within each of the three visits, to ensure continuity across the interviews. These three schools covered a range of more rural locations. Two schools were in the Sindhupalchowk district, approximately four kilometres apart. They were approximately 70km, or three to four hours from Kathmandu, with the final 23km off the main highway, on poorer quality roads. One of these schools was on the outskirts of a town, and the other was approximately a further 30 minutes beyond the town on a poor-quality dirt road. The third school was further from Kathmandu, approximately 130km, or six hours, with the second half on the journey off the main highway. There was evidence of previous blacktopped road construction, but a lack of maintenance and high traffic has left it in poor condition. This school was on the outskirts of a town.

The final case-specific interview was conducted in Kathmandu, with the funding and project managing partner, and another representative from the organisation, who was also present to offer insight into future school reconstruction work they have planned. This interview was conducted in English, without the need for an interpreter. This focussed on one school, in the Dhading district, but highlighted some comparisons between two other schools they had reconstructed, in the same district. All three schools are on the outskirts of a town, approximately 90km from Kathmandu, a journey of approximately three and a half hours, along a highway. Each school is then accessible by poor quality, unreliable roads from the town, or on foot, which is a journey of approximately 45 minutes.

To broaden the reach of the study, the online questionnaire was set up to replicate the interview questions where it was not possible to speak directly with the stakeholder, although uptake of this was also limited, with only one additional case-specific school participating through this mechanism. This questionnaire was completed by the construction manager for the reconstruction of two schools in the Ramechhapp district. The questionnaire was completed in English, so no translation was required. The case study school was approximately 8 hours from Kathmandu. Four hours of this journey was on the good quality highway, followed by three hours on a stone paved road, and the final hour on an unpaved, poorly carved road.

This sample of six case-specific schools was chosen as they provide a good range of individual project contexts, from which specific good practice for the given challenges can be identified. By interviewing a range of stakeholders, holding different roles within projects, this also provides understanding from different perspectives, and bringing different areas of experience, each adding specific value to the interview data collected. By interviewing stakeholders of similar roles between projects, it was possible to compare and contrast their experiences, and the experiences of the other stakeholder roles investigated. This provided greater insight from the interview data and was an additional measure in reducing bias and identifying outlying results.

Across the six schools, some were selected as they were the same district, and general context, as schools investigated in the Phase One study, allowing another avenue for comparison, while additional schools in districts not previously considered, were also included to broaden the contexts studied. While a larger sample of case-specific schools would have provided additional breadth of the individual project contexts considered, these six schools provide sufficient similarities and variation from which to identify specific contextual challenges and good practice. It was not possible to increase this sample, owing to the practicalities and constraints of conducting this fieldwork, in particular accessing schools in more remote locations. However, by implementing a blended research approach, this more generalised insight, considering the broader range of contexts, is provided through the high-level interviews, to support and complement the case-specific studies.

5.3.2. High-level interviews

Alongside the case-specific interviews, four high-level interviews were conducted, to understand the broader reconstruction process, and associated challenges and good practice, to better assess the general applicability of these findings. As with the Phase 1 study, the number of participants in the sample is small. However, as shown in

Table 5-2, each participant has been selected as they bring insight into a range of contexts, with experience in different aspects of the school reconstruction process. There are some areas of similarity between participants, allowing for comparison between their experiences, while still providing a good coverage of the broad array of contexts.

Three of the four interviews were conducted with NGO stakeholders; NGO stakeholders were targeted as they bring experience of direct involvement in projects, and typically interact with other stakeholders at all levels, coordinating with school and community representatives, masons, engineers, project funders, and government bodies. They are therefore well-placed to offer insight into each of these relationships, with a good basis and understanding of individual project contexts. Each of the NGOs represented were a different size and had different focuses (two are involved in reconstruction in other sectors such as housing and medical facilities as well as schools, and the other has a sole focus on education, including long-term and broader educational involvement). Each organisation had involvement in different geographical regions across the earthquake-affected districts (one primarily works in rural areas in two districts, while the others have projects across many of the earthquake-affected districts, one in more remote and the other in more accessible locations). These NGOs also work with different construction typologies (including one focusing on CSEB and stone construction, and two focusing on reinforced concrete with fired brick construction).

Of the organisations represented, one had been in operation, conducting school construction and retrofitting activities prior to the 2015 earthquake, providing insight into the specific challenges and changes that have occurred in a post-earthquake context; the other two began work in this field following the earthquake, providing insight into the challenges associated with navigating a new system, and altering approaches to find the most effective reconstruction mechanisms.

All three NGO stakeholders were identified and approached directly by the researcher, in order to reduce the potential for bias, through unseen power dynamics and 'echo chambers' if these had been arranged by other participants. However, this was not possible in the case of the fourth interview, which was conducted with a government engineer, working within the CLPIU-Education. It was important to garner the perspective of a stakeholder at this level, as they offer greater and broader insight into the overarching school reconstruction process in Nepal, against which all other interview responses can be compared. It was not possible to directly approach this stakeholder, instead requiring an intermediary to set up initial contact.

This was done via an academic professor in Nepal, who contributed to the complementary research activities. This was preferable to establishing contact via a case-specific or high-level interview participant, with greater potential for introducing bias, either through only highlighting similar viewpoints, or through the influence each participant could have on the other. This high-level participant provided into governmental involvement and processes, and was able to consider the impact of such diverse project contexts, the suitability of each construction typology, and assess the progress and delivery of reconstruction across all earthquake-affected districts. This also helps to measure the accuracy of the data provided in the NGO high-level, and the case-specific interviews, and therefore reduce bias.

As opposed to the case-specific interviews, all high-level participants had a good level of spoken English, so it was possible to conduct these interviews without the use of an interpreter, aiding more direct conversation and better interview flow.

Table 5-2 - Overview of Phase Two high-level interview participants, detailing their role and relevant experience, indicating the value they add to the sample and data collected

Participant	Role	Experience/insight offered
1	Government engineer	General assessment and oversight of all school reconstruction activities across the 31 districts, including government processes for (including design requirements, approvals and monitoring processes), consideration of all relevant construction typologies (both approved and not)
2	NGO programme coordinator	Within NGO with pre-and post-earthquake activity, retrofitting and reconstructing schools. Overseeing delivery of multiple school reconstruction projects (construction using reinforced concrete and fired bricks), within a larger school reconstruction programme, across a range of urban and rural locations. Responsibility for liaising with field and office staff and project partners, project reporting, broader disaster preparedness efforts delivered alongside school reconstruction.
3	NGO programme operation director	Overseeing all school reconstruction works within the NGO, with experience of both pre- and post-earthquake construction (providing comparison of earthquake impact on construction process). With responsibility for developing plans for, and tracking, project implementation (including timescales and budgets), liaising with all local field offices (typically rural locations). Also delivering broader educational programmes alongside reconstruction, to provide general improvements to education.
4	NGO business developer	Post-earthquake experience, focused in rural locations, initiating and implementing reconstruction programmes, across educational, as well as residential and medical sectors, using CSEB and stone masonry. Navigating funding, approvals, and regulatory mechanisms, liaising with project partners, engineers, and project managers. Reporting project progress. Experience of coordinating school reconstruction alongside and as part of broader reconstruction efforts, and the related challenges and mutual benefits.

5.3.3. Additional research activities

In addition to the case-specific and high-level interviews which formed the bulk of the data collection, a number of other complementary research activities were conducted. This blended research approach provides broader context and understanding of school reconstruction and the factors that impact upon this, to better ground the case-specific and high-level interviews, giving additional detail and reducing the potential for bias. These activities included meetings with professors of engineering, and I/NGO representatives involved with broader reconstruction and recovery efforts, and field observations for example while visiting reconstructed schools and surrounding communities.

A tour of a school in Kathmandu highlighted their earthquake procedures and safety measures. There are designated assembly points in large open areas, radios to contact relevant authorities, first aid equipment and food and water stores, all of which are recorded on a system to flag items due to expire, in order to keep all the stores up to date.

One meeting focused on the process of conducting damage assessments of schools following the earthquake, of all public schools in the 14 affected districts. These assessments were conducted by engineers, but there were also surveys that could be completed by the schools, to submit their own data. The data collected has been used to help allocate schools for reconstruction, based on need. As well as the damage caused by the earthquake, a meeting with another participant focused on initial and long-term recovery efforts with the provision of temporary and transitional learning centres, to provide safe learning spaces before permanent structures could be rebuilt. This meeting used a small portion of the wide scale interview schedule, but mostly took the form of an open, unstructured interview.

Meetings were also held with representatives from two NGOs. The first of these was to discuss their overall approach to construction, including their housing reconstruction and retrofitting efforts, and how their lessons learnt in this have fed into their newer work into school reconstruction. It was also possible to view a couple of their school design drawings and a mobile app they use when setting up and delivering housing construction projects. The meeting with the second NGO, focused on the history of school construction in Nepal, and broader details of their school reconstruction programmes, and how these have evolved over time, from retrofitting prior to the earthquake, to reconstruction following the earthquake, and long term aims to move back to retrofitting. One of the wide scale interviews was conducted with another representative from this organisation.

To complement the high-level and case-specific interviews, an unstructured interview was conducted with a stakeholder in another INGO, with greater involvement in the delivery of temporary and transitional learning facilities. The transcript of this interview is also provided in Appendix G. Two meetings were also held with professors of engineering, with expertise in construction materials and structural engineering. They offered insight into the history of construction in Nepal, including the introduction of the Nepal Building Code, the use of different construction materials, and the challenges involved with these, particularly how their use vary from policy to practice, which will lead to reduced strength and seismic resistance. As well as meeting with academics, during the visit it was possible to meet with several other PhD researchers working in Nepal, focusing on different aspects of reconstruction and earthquake and hazard resilience. This was a good opportunity to discuss the broader context of the research and understand more about the broader research field. These projects include housing reconstruction through an owner-driven approach with a focus on gender roles, multi-hazard resilience with a focus on water and sanitation, landslide risk communication, and disaster risk reduction planning.

5.4. Results and discussion

During the fieldwork many useful insights were gained and a good set of data was collected, making the trip very worthwhile. The interview questions covered the materials used and the design of school buildings, the process of setting up and conducting reconstruction projects, including funding mechanisms and project roles, and the challenges faced within the project, and good practice to overcome these challenges.

5.4.1. Project delivery mechanisms and stakeholders

The first aspect of decision-making when initiating and conducting a school reconstruction project is governance, understanding the key stakeholders involved in the process and the processes and policies that must be adhered to. It is important to understand the frameworks within which the projects must be completed, as well as understanding the requirements of schools to be reconstructed.

Within the interviews, participants were asked about the roles each stakeholder takes, and how different aspects of projects (including funding, design, and coordination) are organised.

As shown in Table 5-3, participants reported a number of roles and responsibilities for each stakeholder group within a school reconstruction project. The specific roles may differ for individual projects, depending on how the project is coordinated and implemented (as discussed below), for example, which stakeholder takes responsibility for overall project management, the hiring of labour and purchasing materials, and who is providing the funding for projects. However, there are key roles that each stakeholder group take within most projects, including: engineers (either independent, or within an I/NGO or contractor organisation), will be responsible for completing the structural design, providing training and technical support, and supervising construction to ensure quality within construction; government bodies (CLPIU and DLPIU) are responsible for overall school reconstruction coordination, and granting approvals for school designs, and should complete checks on projects, to ensure designs are constructed properly; and labourers (either professional contractors, skilled masons, or local labour or community volunteers), are responsible for completing the main construction work. These roles therefore impact stakeholder perspectives within the projects they deliver. This is important to acknowledge within this research, when collating the findings and producing a framework to assist with reconstruction, to ensure these can be appropriate for each stakeholder group who may use them.

In 2016, the Central Level Project Implementation Unit – Education (CLPIU-Education) was established, to oversee all reconstruction of schools across the earthquake affected districts. The first step within the school reconstruction process is to identify the schools to be reconstructed. As discussed in several of the additional meetings conducted, including one stakeholder directly involved in the implementation, following the earthquake the Structural Integrity Damage Assessment (SIDA) was conducted, to assess the level of damage at each school in the earthquake affected districts. The results of this assessment helped the government to prioritise schools for reconstruction, initially focusing on schools that had suffered greatest damage, schools with the greatest number of pupils, and where alternative teaching facilities were not available.

Table 5-3 - Stakeholder roles, identified by interview participants.

Stakeholder group	Key roles:
School/ SMC	Setting up/coordinating projects, preparing school site, providing materials, legally a partner in construction, consulted on decisions, for SMC led - purchasing, hiring contractors.
NGOs	Completing design and provide technical support and supervision (if engineers in house), some provide funding, give training (technical and project management aspects), project management, for NGO led - they oversee and arrange everything (including hiring contractors/local community labour). Liaise/engage with communities (sometimes through social mobilisers), Across multiple projects track programme implementation and budget, maintenance checks on projects.
Engineers	Site/construction management and supervision (continuous or intermittently), provide technical support and training, checking quality of construction, completing design, communicating design to other project partners (school and NGO etc). Long term - peer review process for designs to maintain quality. Engineers should be registered with Nepal Engineering Council.
Labourers	Constructing the school according to the design - may be professional contractors, masons, local community volunteers, entrepreneurs, or a mix within projects - variety of skill, but often receive training, or provide training (if professional contractors)
Government	Checking construction quality (approximately 2-4 times throughout), both district (DLPIU) and central (CLPIU) supervision, design approval (local and central), approval for other works e.g., cutting down trees (through different government bodies e.g., Ministry of Forestry), provide training for engineers, some local political involvement, implementing/initiating projects, providing funding for SMC led projects. CLPIU coordinating/tracking all school reconstruction and project agreements.
Community	Provide labour (volunteer or some contracted locally), and additional support e.g., providing materials, local political involvement, community involved in decisions for projects.
Others	Additional involvement from local political parties, involvement by JICA, ADB etc. providing funding, funding through personal donations and philanthropic involvement. Social mobilisers (can be within NGOs) to engage with communities.

It was reported in one high-level interview that there are three main modes of project initiation and delivery. Firstly, equipping schools and SMCs to manage and deliver the reconstruction for small scale projects (<20000NPR, reported to account for approximately 75% of the overall school reconstruction efforts). Secondly, partnering with NGOs and aid agencies to coordinate projects, accounting for approximately 15% of projects. Thirdly, school reconstruction projects coordinated directly by the government and the CLPIU, and run by professional contractors, accounting for the remaining 10%. Carter (2020) also reports this 75%, 15%, 10% split, although it should be noted that latest figures published by CLPIU-Education (2020) (at the time of writing) suggest this is closer to 82%, 8%, and 9%for SMC, I/NGO, and contractor respectively.

With the majority of projects being delivered by SMCs, there is by definition already some involvement of the local community who have good knowledge of the needs of the school and local area (which is important for siting of the school and understanding transport issues etc.); however, it presents challenges in that SMCs generally lack the experience or skills to manage construction projects (as one high-level participant highlighted the need to train SMCs in project management aspects), and limits the ability for a joined-up approach between multiple schools and organisations. On the other hand, the projects led by the contractors and other experienced organisations will have good experience of delivering schools – one high-level participant reported that their experience meant they were able to mitigate against potential challenges:

> *"community involvement is not a problem for us … Because we are working with the community since long time … We know how to work with them",*

while another reported:

> *"after the earthquake we have … reviewed our school construction activities that were done prior to the earthquake … [and therefore] we updated our design".*

This also links in with the funding mechanisms for projects, which can affect delivery of specific projects, and the broader approaches of organisations. The funding mechanisms identified within this study include: the government, NGO/aid agency funding, international funders, and individual donors or fundraising efforts. Where funding comes from individual donors, this appears to generally be established for specific schools or areas, where the donors have existing links, and this can lead to projects over a much wider geographic area. One organisation involved in a case-specific school reconstruction project had existing links with several schools that had been damaged, and so coordinated fundraising efforts in order to reconstruct those schools.

Once projects are initiated, they must apply for project approval from the government, in order to approve the design. This process can be complex and time consuming, requiring approval to be sought by a series of different levels of government, from district to CLPIU-Education. This is a positive step in the process, to ensure that there is quality checking within the design process. The CLPIU-Education have also produced a number of standard designs that organisations can use, to make the approvals process easier, and some participants reported that their organisations compiled their own set of standard designs. However, there is the potential for issues arising, if providing this 'one size fits all' style solution. One high-level participant from an NGO reported they their organisation used three standard, government approved designs (a two storey, four classroom reinforced concrete block, and a two, and three classroom single storey block with CGI sheeting for the roof). When planning projects, they selected the designs based on the land available, soil quality (limiting foundation design), and the school requirements (the number of children and number of rooms needed). However, with limited options, and insufficient communication and consideration of site constraints and school requirements, there is the potential that unsuitable designs are adopted, affecting construction quality and delivery, and functionality. In the case of projects delivered by NGOs and INGOs, the interviews revealed that these organizations tend to develop a pattern of school delivery (e.g., they may only deliver one specific building technology (e.g., CSEB) or one location (e.g., urban Kathmandu). This has the benefit of growing expertise and empathy for these specific contexts and communities; however, has the potential for a mismatch between the type of project they deliver and the requirements of the receiving community. For example, challenges of transporting chosen construction materials to site were identified: one high-level participant reported:

> *"Because of damage of road … bricks [are] broken ... sand … spills somewhere … that's a loss",*

while another reported:

> "carrying fired bricks on someone's back, for two days, it's not feasible, it's not feasible all over Nepal ….. It's a major challenge to get good materials on the site so you can start building. Fired bricks are breaking on the way, cement has not been stored properly".

This would suggest that using a different construction material, making use of more local resources, may have been a more suitable solution in individual contexts. Other case-specific schools reported that the limitations of the project meant that the new facilities did not meet all of their needs: one reported that it was not possible to include a hostel within the design, despite the school providing residential care for pupils, while another reported that to improve the construction they:

"would make a two-storey building, as the classes are not enough for the children."

Additionally, the high-level government stakeholder emphasised that earth bag technology, while common in housing construction, was not given approval for school reconstruction and should not be used in projects; they reported that they were incapable of withstanding the overturning moments, and using steel reinforcement for added resistance was unsuitable, as steel and earth are incompatible and would lead to rusting. However, as discussed in Chapters 2 and 4, there are examples of school reconstruction using earth bags (in literature and in the pilot study). Other participants also reported inadequate approvals and checking procedures, before, during and after construction. This raises concerns over the efficacy of the approvals process, and could cause issues over the quality of construction, and construction not following the pre-approved design, affecting the safety of the school buildings. This also links with potential corruption within the process, cutting corners within the design and construction.

5.4.2. Challenges and good practice

Within the pilot study, six key challenges affecting school reconstruction were identified: 1) accessibility and transportation, 2) government processes, 3) community involvement, 4) skill and availability of labour, 5) quality and availability of materials, 6) suitability and availability of land. The pilot study also highlighted an imbalance in levels of reporting of different challenges between case specific and high-level participants. One of the primary focusses of the phase two interviews was to explore these six challenges in greater detail, understanding the relative impact each challenge has on projects and the specific affects they can have, as well as providing a better understanding of the identified imbalance in perspectives at the case-specific and high-level scales. The results are shown in Figure 5-2, comparing the number of reports within the pilot study and phase two interviews, as well as the reports by case-specific versus high-level participants.

As Figure 5-2 shows, accessibility and transportation was the most commonly reported challenge with 18 individual reports across the 20 interviews conducted in the two phases, while challenges relating to materials and land were least frequently reported, with ten and nine reports respectively. While it is useful to see the total reporting values for the two visits, Figure 5-2 shows a discrepancy in the reporting of some challenges between phase one and phase two results, such as land availability (two reports in the first visit, seven in the second), and community involvement (nine and four in the first and second visits, respectively).

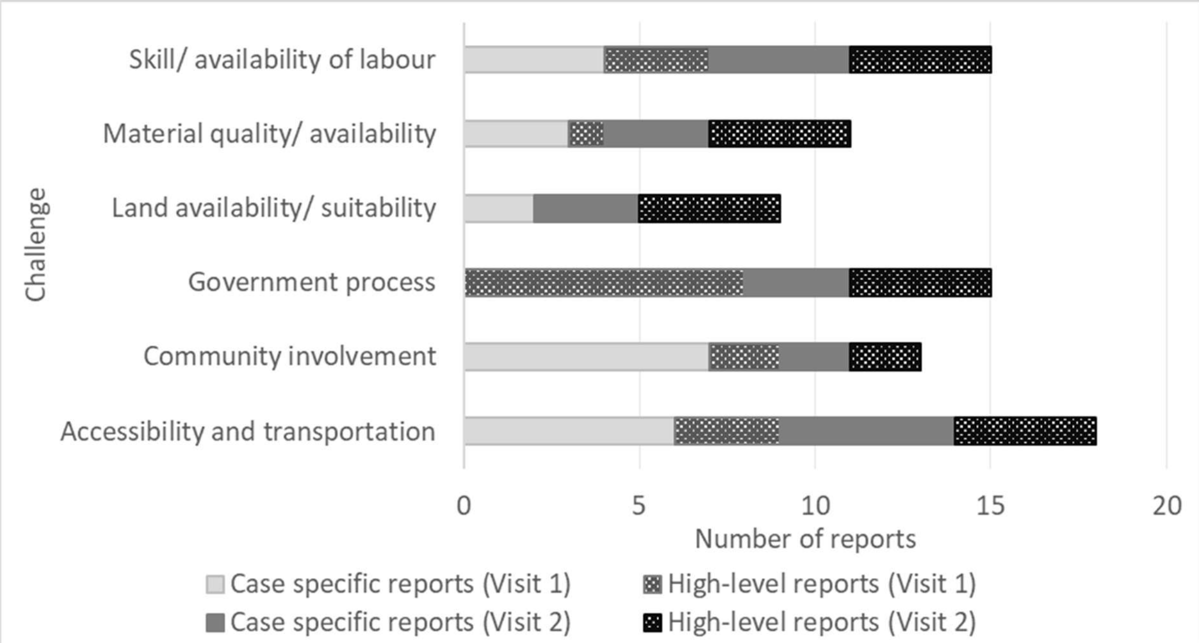

Figure 5-2 - Challenges affecting school reconstruction in Nepal, reported within pilot study and phase two interviews.

It was seen within the pilot study that rural projects experienced more challenges than those in urban areas. Therefore, the phase two interviews had a greater focus on rural projects, with a higher proportion of participants having experience of rural school construction, particularly for case-specific schools, in which five out of the six were in rural locations or within a town a long way from Kathmandu, facing many of the same challenges of accessibility and access to resources as a rural school. This is reflected in the reported impact values; for the one case-specific school in Kathmandu, only two of the six categories were reported as challenges for the project, and these were only minor, while the other schools experienced more challenges, and at a greater impact. This will have influenced the shift towards greater numbers of reports of some challenges, particularly for land and materials which are very dependent on location, with limited suitable land to construct on, and reduced access to quality materials. While this does cause a shift in results for the second visit, with generally higher numbers of reports for challenges, as shown in Figure 5-2 this is better representative of challenges across all earthquake-affected districts, most of which are rural.

While it is useful to see the most commonly reported challenges, or those that may occur most frequently, this does not necessarily represent the impact each challenge may have on a project, or how easily these challenges can be addressed. Figure 5-3 shows the levels of reporting by both case-specific and high-level participants, as proportions of the total reports for each group, as well as indicating the mean impact rating given to each challenge. This highlights that there are several areas, such as community involvement and the government process, that are perceived differently at different levels, both with respect to the occurrence and prevalence of each challenge and the impact they have on projects. The perceptions of relative impact of each challenge are demonstrated in Figure 5-4, which shows the mean impact of each challenge, as assigned by both case-specific and high-level participants, as well as showing the mean impact rating from all responses within the phase two study. It is important to note that all impact values assigned by case specific participants were generally lower than those of high-level participants, with fewer challenges identified as major challenges.

Having highlighted challenges, participants were then asked to identify good practices that had been implemented within projects, to overcome or mitigate these challenges, and the contexts in which these practices would be suitable. A summary of all the reported challenges and good practice are provided in Table 5-4, and are discussed in detail in the following sections.

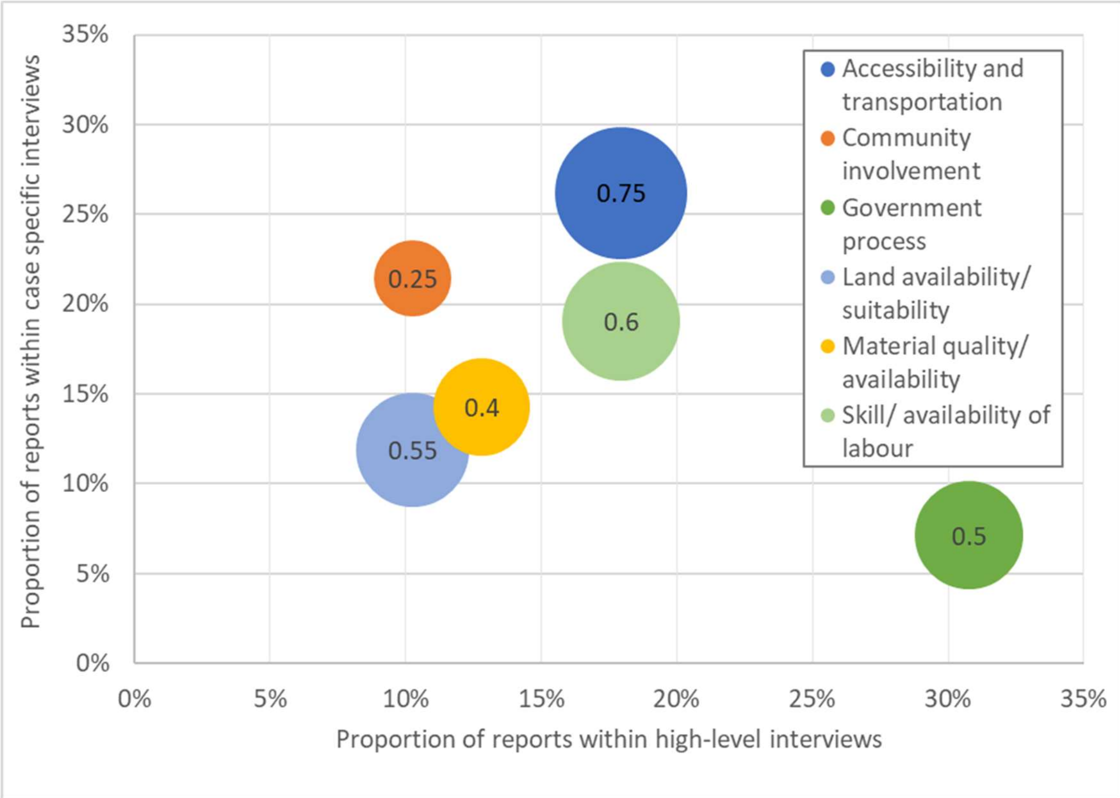

Figure 5-3 - Challenges reported, as proportions of total reports, within the Visit 1 and 2 interviews, by participants in the high-level interviews, vs. participants in case specific interviews, scaled by the relative impact of the challenge (shown in bubble size and value in each bubble). Impact values are between zero (no challenge) and one (major challenge).

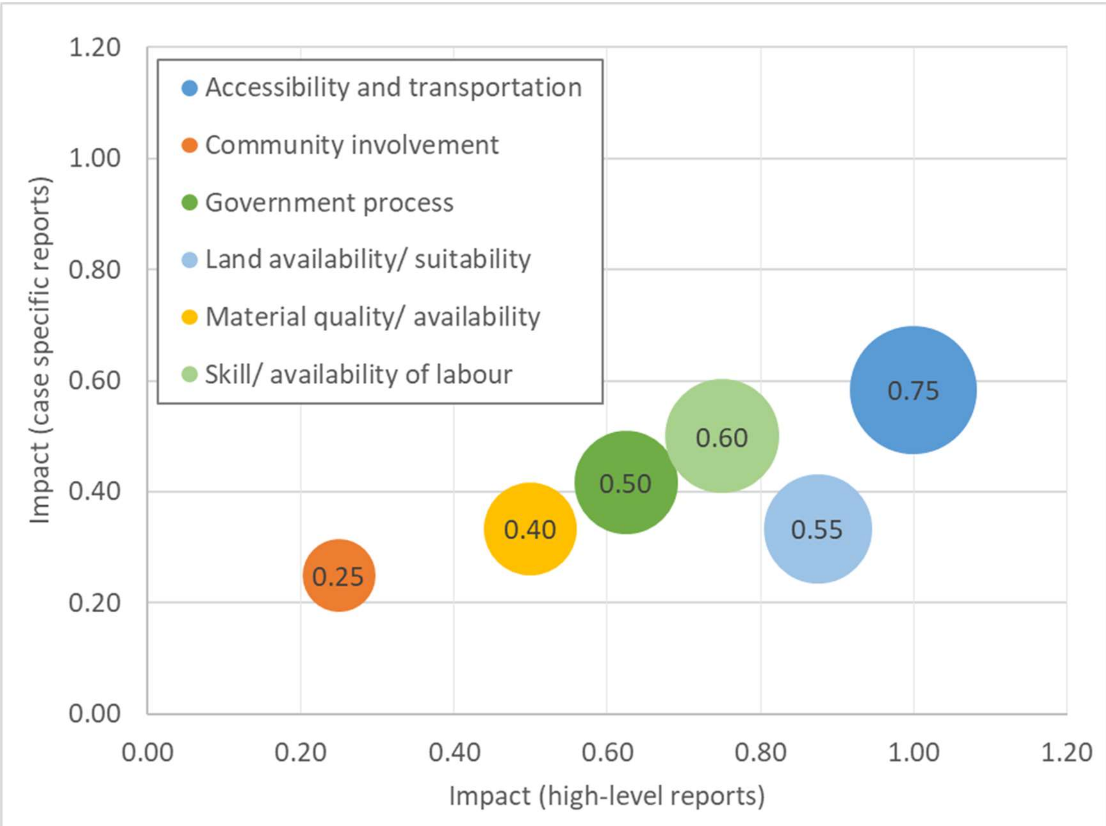

Figure 5-4 - Relative impact of the six challenge categories, as reported within the high-level and case specific interviews, with the size of the bubbles scaled by the combined impact score as a mean of all responses (and shown in the value in each bubble). Impact values are between zero (no challenge) and one (major challenge).

Table 5-4 - Summary of all of the sub-challenges reported in phase two, for each of the six challenge categories, alongside the relevant reported good practice

Challenge category	Detailed description of most quoted challenges for this category	Relevant good practice
Accessibility and transportation	Seasonal and poor-quality roads cause delays, lack of transportation, areas with no vehicle access, increased costs to transport materials (due to distance, difficulty and damage to material)	Coordinate with road reconstruction projects, avoid monsoon, transport materials before the monsoon, adjust budget based on level of accessibility to account for transport costs, use local or light-weight materials if no vehicle access to site
Community involvement	Balancing expectations with budget and feasibility, hard for communities to engage in reconstruction causing lack of ownership, vulnerable communities lack advocacy, hard to predict level of community engagement, SMC have limited experience managing projects, lack of trust in school safety (children scared to return to school), desire for seismic features lessens over time, schools lack emergency funds to cover disasters, disruptions to school while used as shelter and during construction, unsafe construction sites cause injuries to students, time-pressure and delays means unfinished buildings used for teaching, hard for communities to adopt new technologies, inadequate space to teach in temporary facilities, limited budget means not all necessary facilities provided or poor quality construction which affects quality of education, additional costs of furnishing schools not included, parents reluctant to send children to school if they can help at home or on farm land	Communicate with community/school about facilities required and importance of seismic design, identify ways for communities to be involved in reconstruction (inc. sourcing local materials, demolition, labour), define involvement within contract between community and project partners, do not assume level of engagement of community, train staff to mobilise communities, provide project management training for SMCs, utilise pre-existing links with communities, work with local entrepreneurs, encourage schools to set up an emergency fund, secure site and keep tidy during construction, long-term involvement for maintenance, use temporary facilities, away from reconstruction site to minimise disruption, split teaching time if enough temporary facilities cannot be provided, consider provision of additional materials (inc. furniture, educational materials, technology), provide incentives to encourage children to attend e.g. lunches, improve accessibility for disabled students and to aid evacuation
Government processes	Inadequate temporary facilities, political situation inc. fuel crisis, newly established government bodies to oversee construction lacked capacity, local politicians causing delays in projects, limited budget prevented design meeting full school requirements, remote areas receiving less support, lack of coordination between school and	Long-term planning (inc. TLCs) informed by damage assessments, strong central and local government coordination (within C/DLPIUs for education), engage with stakeholders throughout, consider distribution of projects (e.g., working on multiple projects in a small area, or involvement in similar schools/construction methods), utilise existing links with

	housing reconstruction, lack of monitoring, difficulty translating designs for field level, complex and time consuming approvals process, lack of transparency in the process, approvals process does not apply to private schools, lack of coordination between local and central government, corruption.	schools/communities, school reconstruction for skill and technology transfer, develop remote monitoring tools, regular monitoring/checking, use a set of standardised designs, consult schools to understand requirements, track timescale/costs throughout, transparency in spending e.g. in registered bank account, design review process to overcome issues.
Land availability and suitability	School sites vulnerable to hazards, lack of suitable space, lack of ground investigation to identify problems, disputes of land ownership	Site assessments, avoid sites exposed to hazards, plan for mitigation actions (e.g. flattening land, retaining walls), range of designs to fit the site, account for unknowns in ground conditions, ensure permission and rights are in place.
Material quality and availability	No 'one size fits all' material, sourcing materials (inc. access to local markets, availability due to supply/demand gap, high costs), lack of water supply for construction, design and approvals (seismic design elements add cost, new materials used that are unfamiliar, ensuring materials meet design specification), quality assurance, communicating design requirements, temporary learning centres not suitable or used beyond planned lifespan	Assess suitability of materials for the project context, test material quality, work with a network of local entrepreneurs to invest in local skills, dress stones for regular shapes and use corner/through stones to improve masonry construction, allow for higher material costs, hire a warehouse to store and control supply chain of materials, make use of local materials and markets where suitable, include provision of water supply within construction project, have continuous review process of designs, have a range of standard designs, use ring beams within the construction, supervision and monitoring during construction, ensure climate is considered within design of temporary facilities
Skill and availability of labour	Labour intensive, lack of skills, retaining labour, and shortage of labour	Utilising technology, working with skilled professionals, providing training, long term engagement across multiple projects, making designs understandable for field-level, supervision and monitoring of quality

5.4.2.1. Accessibility and transportation

Participants reported a range of challenges relating to accessibility and transportation, including increased costs of transportation in less accessible areas, and difficulty transporting materials where there is no vehicular access or seasonal roads. Accessibility and transportation received relatively even reports from both high-level and case specific interviews, as can be seen in Figure 5-2 and suggests that there is a balanced appreciation of this challenge at both scales. One high-level participant reported:

"in inaccessible areas … we cannot transport materials [or] equipments (sic) … for reconstruction…..It is a big challenge, especially in the mountain",

while a case-specific participant highlighted that, due to the fuel crisis at the time of the reconstruction:

"we couldn't get trucks to … carry our bricks to the site … we didn't have trucks to carry the sands and cements to the site … that was a huge problem that time, we had to face."

Another case specific participant reported delays to one phase of their reconstruction due to the monsoon, while the other, completed outside the monsoon season did not face those challenges:

"starting in the rainy season … they couldn't bring … as much as they want because of the road condition … After the rainy season it was easy".

The awareness of this challenge was prevalent in case-specific responses, as the majority of these schools were in rural locations. This challenge was also observed by the researcher during both fieldwork visits, as depicted in Figure 5-5, in which a road is being reconstructed following the monsoon.

As indicated in Figure 5-4, it was also identified as the challenge with the greatest relative impact, with a mean impact value of 0.75. It should be noted that this represents the mean challenge across all school reconstruction efforts; however, accessibility challenges are generally greater than 0.75 in rural areas and less than 0.75 in urban areas. This is mirrored in the responses of the participants, with only the urban case study, in the outskirts of Kathmandu, reporting no challenge relating to accessibility, whilst the rest reported it as either a minor or major challenge. This is important to consider when implementing reconstruction projects, as there is little that can be done to alter the accessibility of a project site; therefore, identifying good practice that can mitigate the challenges caused is essential. One high-level and one case-specific participant highlighted reducing delays by avoiding construction during the monsoon season:

“we didn’t want anything to be done during the rainy season … because [the] road could be like, destroyed during that time”.

Another high-level participant reported:

“we have categorised the sites according to the accessibility….easy, medium and hard…if the site is hard to reach, the contractor gets more transport cost….that's why, there is no [sic] any problem of transportation actually”.

This shows that when good practice is implemented, it can be effective in overcoming, reducing or mitigating challenges, to allow projects to proceed with fewer delays and better managed costs.

Other reports of good practice to reduce the challenge of accessibility include coordinating school reconstruction with seasonal road reconstruction projects, so that transport routes to site are reinstated prior to school construction. In areas where there is little, or no, road or vehicle access, participants reported using light-weight materials to make alternative transport methods such as porters and mules more feasible. Additionally, making use of local resources, either through purchasing from local markets, or where feasible, sourcing stone, sand, gravel, and timber locally to the site (as shown in Figure 5-6); however, the importance of doing this sustainably, and in accordance with government restrictions, was highlighted. This impacts upon the choice of materials used within the design and should be considered carefully within the planning phase of projects.

5.4.2.2. Community involvement

Unlike accessibility, some challenges, such as community involvement, have discrepancies in reporting levels between high-level and case specific participants; Figure 5-3 shows that community involvement represented over 20% of total case-specific reports versus only 10% of total high-level reports.

Figure 5-5 - A seasonal road being reconstructed following a landslide, using an excavator (seen back left of the image).

Figure 5-6 - Sand and gravel being collected from a river, next to an existing school, for use in local construction.

Challenges relating to community involvement include difficulties balancing community expectations with project budgets, SMCs having limited experience, and a lack of awareness of the importance of seismic-resistant features. Figure 5-2 and Figure 5-3 show that there were high rates of reporting within case specific interviews, against relatively few reports by high-level participants. This is likely due to community-related challenges being more easily identified on a case-specific basis, with perspectives drawn from direct experience of engaging with a community, or reflecting that this is the lens through which they view the project. One case-specific participant highlighted that the local community were involved in providing some contribution to the labour force, but delays were caused when:

“social events took local workers away”.

When reflecting on how the project could have been improved the interview participant reported that they would

“better define the contract between NGO and community especially in community involvement and contribution”.

Another case-specific participant reported that there were lots of disputes and tensions with the local community, over where the funding had come from, what was being funded, and who was receiving the help. They reported that this had caused delays and difficulties throughout the project, and that during the school inauguration, they had to clearly outline all the decisions that had been made, to ensure the community were onboard with the project. As highlighted for government involvement, ensuring effective stakeholder engagement throughout the process can also work to mitigate this challenge. One participant also highlighted the practice of providing training for NGO staff in social mobilisation and community engagement, to ensure that this process is done well.

This challenge was also reported to have the lowest impact, of only 0.25, by both case specific and high-level participants, as seen in Figure 5-4. Four of the six case-specific interviews ranked community involvement as “No challenge”, as well as two of the four high-level interviews. This was influenced by participants reporting either a positive experience of community involvement, or through implementing good practice to mitigate against the potential challenges highlighted. It was also highlighted that community engagement is unpredictable, and it is important to not make assumptions about the level of engagement, or potential issues that may arise within this area. Participants reported a range of good practice including:

“members from school management committee … we provide them [sic] … one day training [on] project management”;

“Whenever a school was being constructed, the School Management Committee was always brought into the meetings and orientations, and that’s how they were involved as a community.”;

and, when involving the community in some of the tasks linked with the construction, such as sourcing local materials,

“there was a partnership we had with the locals, … we wanted to make sure … they feel … they have the ownership of the school as well. It’s not that the school is going down there [sic] and we are building it for them.”.

While the mean impact of this challenge is lower than the others, it should be considered in all future work, as, when not well managed, it can still have a negative impact on projects. As such, it requires implementation of good practice to ensure good management and engagement to effectively work with communities and mitigate the potential challenges that may arise.

5.4.2.3. Government processes

Similarly to community involvement, discrepancies in reporting levels between high-level and case specific participants were also seen in challenges relating to the government processes; Figure 5-3 shows that this challenge represents over 30% of the total high-level reports and less than 10% of case-specific reports. While there was more uniformity within phase two responses, these differences are also clearly shown in Figure 5-2, with government process receiving eight reports from high-level, and none from case-specific participants. This does not indicate that these reports are incorrect, or that one group is more accurate than the other, but that these differences occur due to the particular lens through which they view and experience the school reconstruction process. This instead makes it of additional importance when planning projects, as it highlights that different stakeholders experience and view projects differently, and this range of views must be appreciated and acknowledged effectively in order for reconstruction projects to run most successfully.

Challenges relating to the government process included:

"In the initial phase NRA was not yet established",

"design approved slowly",

and as one high level participant reported:

"it's a learning curve, so us working with them, I wouldn't say they have improved so much, maybe it's more that we have learnt how to…navigate the landscape".

The high-level government engineer also stated that the overall system could be improved by shifting responsibility from central to a local level, reporting:

"If you truly able to translate [and] decentralise these things to the local level, then it will work better",

but highlighted that:

"the local government, they don't have [the] capacity and resources".

This was seen in initial reconstruction efforts, and the overseeing organisations were newly established, and is something that can be considered moving forwards, and in preparation for future earthquakes, ensuring that the systems and bodies are sufficiently equipped to effectively manage and coordinate the reconstruction efforts.

The imbalance in reporting means that this challenge is underappreciated at an individual school scale or that high-level participants overemphasize the challenge based upon their areas of experience. This can be explained by challenges relating to government only becoming more obvious with experience of numerous projects, which high-level participants have, and they may not be as easy to identify within an individual case specific project, unless there was a significant delay caused by the process. It is interesting to consider the respective impact values given to this challenge by high-level and case specific participants, given the marked difference in levels of reporting. As shown in Figure 5-4, the mean impact across both levels is 0.5, representing a minor challenge to projects; this is split into values of 0.63 from high-level participants, versus 0.42 from case specific participants, which is to be expected given the split of reports. While the impact value was higher for high-level participants, the ranking of this against the other challenges was lower (identified as the fourth highest impact challenge) while the ranking assigned by case specific participants placed it as the third highest impact challenge.

This is useful to consider when planning reconstruction projects, particularly for school or SMC led projects, or for other organisations with limited or no experience of navigating government processes, especially as this accounts for the majority of school reconstruction projects. One case-specific participant, from an organisation with no prior experience of school reconstruction reported that

"the government issues a very ongoing thing … we had to go [to] so many different offices and meet so many different officials, and get things approved, and then, now we have another government just formed … now we have to do everything from scratch again".

However, participants also reported that ensuring designs were completed by qualified engineers made this approvals process easier, so that designs were done in accordance with the Nepal Building Code. If working on multiple projects, particularly the case for contractors and NGOs, having a range of pre-approved 'type' designs was also reported as good practice, so that gaining specific approval for individual projects based on these designs was easier. This approach could also be utilised by making use of the CLPIU-Education's standard designs, and while this can limit the functionality of the design to meet school requirements, over time the number and range of designs has increased; adding more designs to this set would also be beneficial. It will also be important for further work to assess the suitability and safety of these designs.

There were further challenges reported relating to government involvement, at both a local and central level, including bureaucracy, local politicians causing disruptions and delays, limited funding, and corruption. While many of these challenges are systemic in nature, and cannot be addressed fully within the scope of this thesis, some elements of good practice were identified to limit the impact of these challenges, including: effective stakeholder engagement, to ensure that all actors who may influence the project are considered; working on multiple projects in a similar area to develop stronger local connections and establish better working relationships with local stakeholders; ensuring there is a process of regular supervision and checking by multiple levels (including project, district and central level engineers), to monitor quality of construction; and having a transparent approach of tracking and reporting progress (both time and financial) to minimise potential for corruption, including directing project funds through a government-registered bank account.

5.4.2.4. Skill and availability of labour

Labour was the second most highly reported challenge. Of all ten participants, only two case studies reported no challenge related to labour. The specific challenges relating to labour can be grouped into two overarching categories: the skills and availability of labourers.

Firstly, participants reported issues relating to the skill of labourers, for example one case specific participant highlighted that:

“the labourers were not quite as skilled for the new type of building”,

while another reported that it was agreed that the labour would be sourced from the local area but:

“our contractors were limited to certain things … they couldn’t get the skilled labour out there, so they had to take few from Kathmandu”.

Training plays a key role in mitigating or overcoming these challenges, with reports from seven of the ten phase two interview participants (four case-specific and three high-level). This was reported across three main aspects of training: working with labourers who had received training on previous projects; providing on-the job training within the current project underway; and broader training to increase the number of masons and labourers. Other reported good practice included:

“intensive research of manpower, [and] negotiation with local community”,

or:

“[hiring] the professional contractor [for] technology transfer”,

to improve long term skills and access to technology, beyond the span of the reconstruction project. Working on multiple projects in a similar area, particularly where investment in training and technology transfer has been provided, can help improve long term engagement with labour, and could work to increase the efficiency of projects. Participants also reported the importance of ensuring that designs were suitable and translated for field level, to ensure that these were understandable, and masons were able to follow them.

There are also issues of the availability of labourers. Participants reported that they faced difficulties of retaining labourers, particularly when projects were delayed, causing labourers to move to new projects in order to still receive a daily wage. This left gaps and meant projects had to train additional labourers to fill these gaps. One case study participant reported that the overall span of construction covered approximately 2.5 years, although only seven to eight months of this was effective construction time, due to:

"several interruptions and lack of manpower".

There is an overall shortage of labourers, as there is a large demand due to the extent of all reconstruction work, as one participant reported:

"mass reconstruction is taking place in private sector as well … and there is scarcity of the labour".

As well as this making finding labourers more difficult, it can increase the cost of labour. One participant reported that labourers were now moving from Western Nepal to earthquake affected districts, where the daily wage was double the standard daily wage:

"there the unskilled labour charge per day is 500 [NPR] [4.25 USD], and in an earthquake hit areas it's 1000 [NPR] [8.50 USD]".

This can have knock-on impacts to the overall project budgets and spending. The shortage of labourers is also exacerbated by processes that are slow and very labour intensive, such as hand-cutting stones, digging foundations in difficult ground, and demolishing the existing damaged buildings before reconstruction can start.

As well as the shortage of labourers to complete the reconstruction work, there is also a lack of capacity to oversee and supervise this work throughout projects, and to conduct regular checks. This can have a negative effect on the quality of reconstruction and can be particularly important given the lack of skills of the labourers, and the other challenges affecting the overall school reconstruction process. It was reported that there should be regular supervision throughout a project with additional checks, three or four across the construction, to ensure quality of construction. This should be carried out by qualified technical personnel, at multiple levels (including supervision within the organization, and local/district, and central government checks). Where possible, checking should be conducted independently from the funding organization, to ensure transparency and reduce the potential for corruption.

5.4.2.5. Quality and availability of materials

A range of materials are used within school reconstruction, but there are challenges relating to the quality and availability of these materials, and the suitability of the use in specific contexts. The phase two interviews highlighted the use of reinforced concrete and fired brick (within five case-specific schools), and reinforced concrete and stone (within one case-specific school), as well as CSEB, steel sections, CGI sheeting, and timber within the high level interviews. Choosing the most appropriate material for a given school can be difficult, as one high-level participant reported:

"The key is that, none of the materials that we see are perfect for all of Nepal".

This requires organisations and projects to carefully select which materials to use to be most suitable at a specific project site, or may face challenges if using materials not best suited to that context.

Many masons and labourers are familiar with construction techniques with fired bricks and reinforced concrete, although in many cases more training may be required to ensure adequate seismic resistance. Reinforced concrete frames with fired brick infill walls, when constructed using suitable methods offer a good level of seismic resistance. There could be concerns over safety and strength if constructed incorrectly, cutting corners on seismic detailing.

This is a relatively expensive form of construction, required a significant amount of specialised materials, including the bricks, cement and reinforcing bars. However, these costs are feasible in and close to Kathmandu where the materials are easily accessible from markets. The costs can increase significantly in more remote areas that are harder to access, as transporting the materials over the longer distances can be expensive. Journeys on poor quality roads can also cause damage to many of the bricks, again increasing costs due to buying replacement bricks. Most of the material required for this form of construction is only initially available from Kathmandu or international markets. From there they are distributed to local markets in towns outside of Kathmandu, generally along the main highways. Most participants agreed that within Kathmandu, and in close proximity to these local markets, constructing with fired bricks and reinforced concrete was most feasible, and the best option, as materials were readily available, masons were familiar with the materials, and strong, seismic resistant buildings could be constructed. One participant in the wide scale interviews regarded fired bricks and reinforced concrete as the only necessary construction material, and was apprehensive about the use of other materials. This was expressed as fears over a lack of adequate testing and using Nepal as a testing ground for new materials.

Another material identified was compressed stabilised earth bricks (CSEB). No case specific schools in the phase two study used CSEB, although two in the pilot study did. However, one phase two high-level interview participant focussed predominantly on CSEB, and expert meetings also touched upon the use of CSEB. As discussed in Chapter 2, although it is a newer technology, CSEB is included in the government approved design catalogue for school reconstruction. Additionally, of the organisations who use it, it is a well-regarded material, and a couple of the expert participants could also see the potential of this material too. It can also be a very cost-effective material, producing using locally sourced materials, and limiting the amount of transportation of materials required. It is also well received by communities, using brick masonry, replicating construction within Kathmandu, which is desired by most communities.

These bricks can be used as either the main structure, or as infill walls within a reinforced concrete frame. The bricks are produced locally, with no need to fire them, as they cure in the air. This makes them more sustainable, and reduces the transportation costs and challenges. This also can help to improve economic activity in communities, setting up brick making factories, and equipping local entrepreneurs to establish CSEB within an area. The local entrepreneur schemes appear to be very successful, as an efficient practice in project delivery for NGOs, and enabling better uptake of CSEB within communities. The NGO can support the entrepreneur within several initial projects, delivering on-the-job training, and helping to establish brick production, and over time can then decrease involvement as entrepreneurs are capable of taking on work individually. One participant also reported that this scheme helped improve project initiation and open up more channels for projects, as the NGO can set up more projects as they have greater resource through their entrepreneur, and local entrepreneurs have better local connections and access to markets and labour. NGOs can also support local entrepreneurs to access and bid for project contracts that they would struggle to access individually.

However, there are challenges and limitations of CSEB. The locations in which this is a suitable material are limited. Above 3000m, the climate would not be suitable to allow for sufficient curing of the bricks, meaning they would not reach the required strength. The bricks are produced using a mixture of sand, soil and cement, compressed within a mechanical press and left to cure. The benefit of this material is that they can be made using local soil. However, not all locations have suitable ground conditions to provide the required ratios for the mix. It is possible to substitute and add in material from markets, such as bulking the amount of sand, but this affects the cost-effectiveness of the material. Ground conditions close to rivers appear to offer the most suitable make up for bricks, and offer the possibility of sourcing additional sand from the river where required.

As discussed in Chapter 2, and reported within interviews, seismic detailing can be included in the design, with the use of reinforced concrete or timber ring beams, and vertical reinforcement at door and window openings. The bricks are interlocking, helping to improve how the walls tie together. When constructed correctly, construction with this material offers a comparable seismic resistance as fired bricks and reinforced concrete. There are tests that can be conducted to work out the required ratios of the soil and sand and cement. There are also tests that can be completed to test the strength of the bricks once cured. However, currently these tests can only be completed in Kathmandu, and there is much more scope to improve testing. Once these tests are available and more widespread, it is expected that this material would be much better received by more organisations.

This material would be best suited to hilly regions, further from the main highways, where fired bricks would be less suitable. As this material still requires cement and steel reinforcing bars, there is a need to be generally accessible by road, although these materials are less susceptible to damage, so these roads can be poorer quality than is necessary for fired bricks. In more mountainous regions, the altitude is not suitable, and ground conditions are often not suitable, with the incorrect ratios of soil and sand. In regions where this material is feasible, this material could be a very suitable construction material.

While identified within a pilot study case-specific school, and evidence of wider use in reconstruction e.g. (Geiger, 2015; Good Earth Global, n.d.; First Steps Himalaya, 2020), the CLPIU-Education representative reported that although they are approved for housing reconstruction, earth bags are not approved for school reconstruction; this was due to concerns of safety and resilience of the structures, and long term degredation of the material. This raises concerns about the efficacy of the CLPIU-Education approvals and checking processes, and the safety of school infrastructure, both in reconstructed earthbag schools and those constructed prior to the 2015 earthquake (e.g. (Hughbanks, 2011)).

Across high-level and case-specific interviews, a range of challenges relating to materials were reported. Poor quality materials were affecting the quality of construction and increasing costs, as one participant stated:

"over the time of the earthquake, er, reconstruction, and increasingly construction, materials have deteriorated and prices have [increased]".

The urban case-specific school reported no challenge relating to materials, in reference to the reconstruction that had already taken place, having opted for using high-quality materials, despite the extra expense this incurred; however, they highlighted that this meant there were less funds available for additional fixtures and fittings, and that there were the potential that lower quality materials may have to be used in future construction of two more buildings, due to the limited funds. This was also echoed by academics in the field of engineering, who highlighted this decrease in material quality, and the risks associated with using sub-standard materials, for example not dressing stones to be regular shapes, and not using cornerstones or through stones (to effectively tie wall together) within masonry construction. This increase in material cost was driven by the shortages of materials seen, as one participant reported:

"mass reconstruction is taking place in private sector as well … and there is scarcity of the labour…and materials in some cases".

Storage of materials was also highlighted as a challenge, particularly for cement, sand, gravel and bricks, with one case-specific participant reporting that due to having to store materials outside, this space was no longer available for students to use, throughout the duration of the construction, as shown in Figure 5-7. This can also lead to damage of these materials e.g., cement getting wet, and weathering of steel reinforcing bars.

Participants reported a range of practices to overcome the challenges highlighted, including evaluating materials based on technical, social, and economic viability for each site, accounting for higher material costs to be able to purchase higher quality materials, transporting materials prior to the monsoon to reduce delays, and as one high-level participant reported, improving the quality of the materials used through better preparation:

"what we target is the bottleneck, increase the efficiency of cutting and dressing the stones, where especially the corner and through stones are very important for the earthquake resistance".

5.4.2.6. Suitability and availability of land

The reports for the challenge of land availability and suitability present an interesting case. Within wide scale interviews this category received an average score of 1.75 (out of a possible 2), as the second greatest challenge, ranked a major challenge by three out of four participants. However, within case study results, it was the second smallest challenge, with an average score of only 0.67, with only one of six participants ranking it as a major challenge. This could be due to the selection of case study schools, which happened to have good quality land available. However, it could also be that at the individual scale, this challenge is not perceived. Often schools are rebuilt on the existing plot of land where the original school was constructed. Therefore, it is unlikely, particularly by school representative participants to identify this as a significant challenge. However, this challenge could be much more perceptible across the wide scale, with involvement in multiple school reconstruction projects. It was reported that, especially historically, if land was donated, or established by a community, for use as school grounds, then this land was often the poorest quality land, not suitable for residential buildings or agriculture. As one high level participant reported:

"donated land is not always suitable for school construction. They are in the different terraces….and with the very steep contour, steep hill slopes which are vulnerable to landslides".

Evidence of this was also seen when exploring the broader research context in the pilot study: at a school in the north of Sindhupalchowk district, shown in Figure 5-8, which was damaged by debris flow from the hill slope behind the school; and a school right on the bank of a river, constructed on stilts, shown in Figure 5-6. Another high-level participant reported that for one school reconstruction project they were involved in was unable to go ahead as there was no suitable land available:

"in one site, it never got started though….the only land they were able to contribute was completely unsafe".

Five participants (two high-level, and three case-specific) reported implementing practices to counteract or improve ground conditions or mitigate against other hazards such as landslides; these included flattening the site, constructing retaining walls, and conducting site assessments to choose less vulnerable sites. This highlights the importance of conducting adequate assessments of land quality and ensuring that adequate funds are available to safely complete the work required. While it is important to learn from the school and community representatives, with good insight into the local conditions, this must also be viewed from a professional perspective, particularly with engineering insight into ground stability, and external hazards.

There were also delays to construction, due to disputes over ownership and rights to the site, as one case-specific participant reported delays of three to four months for starting construction due to:

"issues of misunderstanding with [the] land".

As discussed in challenges relating to materials, another facet of the challenge of land availability and suitability covered the short-term effects during the duration of construction, in which outside space was limited, due to the storing of materials and equipment. These challenge narratives highlight the interlinked nature of each of the challenge categories, which creates further complexities for reconstruction, and each of the implications of a challenge must be considered, across each category, to effectively address and mitigate them.

5.5. Conclusion

The phase two study was successfully conducted through a second fieldwork visit to Nepal. This chapter presented data collected in four high-level and five case-specific semi-structured interviews, and one case-specific online questionnaire. Complementary activities (four case-specific school visits, and unstructured expert meetings) also contributed to results.

Figure 5-7 - Construction materials stored in the open, on land students previously used for outdoor activities.

Figure 5-8 - A school in north Sindhupalchowk, damaged by debris flows

Three modes of project implementation (through which projects are identified and delivered) for Nepal's school reconstruction were reported: 1) SMC led, 2) NGO/philanthropic organization led 3) government/contractor led. This presents a complex structure for coordination, with each mode involving multiple stakeholders taking on different roles and responsibilities within projects. Seventy five percent of projects are managed by SMCs with little or no experience of construction project management. This creates additional challenges for projects and currently significantly limits the scope for knowledge transfer between projects and stakeholders.

The six challenges considered vary greatly depending on the individual project context, and the experience of each participant. Accessibility and transportation was the most frequently reported challenge and had the greatest impact on projects (0.75 out of 1). This included high delivery costs in remote areas, material damage on the poor-quality roads, and delays due to monsoon damage to roads. Conversely, community involvement (including a lack of community engagement and ownership, and reconstruction not fulfilling the school's needs), was the least reported challenge, with the least impact (0.25 out of 1). The challenge of government processes had much greater emphasis from high-level participants, where long-term effects were more visible. Reports included delays due to the complex approvals process, particularly for inexperienced stakeholders, and a lack of system capacity (e.g., within the newly established NRA, and at a local level). Land availability and suitability presented challenges in selecting suitable sites to construct on, particularly when the donated land is poor quality, lacks space, or is exposed to additional hazards (e.g., landslides). This may require additional funds for mitigation, or limit what can be constructed. One high-level participant also reported a school where reconstruction stopped as a safe site could not be identified. Challenges associated to labour caused delays, increased project costs, and poor construction quality. This was due to a labourer shortage (due to the extent of earthquake damage), and a lack of skills, particularly for newer construction methods.

Challenges relating to the quality and availability of materials (including increasing costs and decreasing quality) affects the quality and safety of construction. Additionally, no single material is suitable across all of Nepal. Participants reported that fired brick and reinforced concrete are appropriate in urban areas, while dressed stone is most suitable in very remote areas, with limited access to other construction materials. CSEB is effective where there is suitable soil composition but is unsuitable at high altitudes.

A range of good practice has also been identified. Assessing accessibility allows for allocating sufficient budget and mitigation strategies (e.g., providing a nearby warehouse, delivering materials before the monsoon). Limiting an organisation's geographical spread of projects aids resource allocation and project supervision. Working with local entrepreneurs can provide greater local knowledge, increase project ownership, and develop skills in an area. Training was frequently reported (by seven of ten participants), including: training labourers in construction methods; project management training for SMCs; and training NGO staff for community mobilization. Engaging with local stakeholders helps to understand the school requirements and increases awareness of the importance of using high-quality materials (e.g., through testing and preparing materials) and seismic design features (e.g., ring beams, lintels, wall connection details), even when these incur increased short-term costs.

Whilst good practice has been identified, this is sporadic (individual organisations only implement a few actions), with little apparent knowledge transfer between organisations. Choosing appropriate good practice is critically dependent on the project context. The next phase of this research, detailed in Chapter 6, will collate these individual items of good practice, identifying the contexts in which each would be applicable. From this, a prototype decision-making framework is produced, to assist with knowledge transfer and improve ongoing and future school reconstruction efforts. There is still a large quantity of reconstruction required in earthquake-affected districts, alongside addressing vulnerabilities in school infrastructure across the rest of Nepal. Lessons learnt should be applicable to the ongoing reconstruction efforts, as well as being transferrable to future upgrade and reconstruction efforts in other areas or in the event of a future earthquake.

Chapter 6:

Decision-making framework

Chapter 6. Decision-Making Framework

6.1. Introduction

Phase two of this study (detailed in the previous chapter) detailed the impact of six key challenges affecting Nepal's school reconstruction process, and a range of good practice that can overcome or mitigate these challenges, demonstrating that it is possible to reduce challenges and improve project delivery. However, it was also found that there are gaps in the delivery of these, with many cases implementing only limited good practice and not mitigating all challenges, with deficiencies in how well knowledge of good practice is transferred between organisations.

In the third phase of the research a prototype framework will be developed, connecting individual items of good practice to specific contexts in which they are appropriate. This framework will aid knowledge transfer and assist organisations in implementing more good practice on a much wider scale. As outlined in Chapters 4 and 5, there are many stakeholders involved in the school reconstruction process, each holding specific roles and responsibilities. It is important that the framework can account for each of these groups, and their needs and potential benefits from interacting with it. This chapter will detail the steps taken to produce the framework, the potential end users, the contexts in which it could be used, and routes for implementation, as well as outlining the results of a validation exercise of the framework, testing its suitability, functionality, and accuracy.

6.2. Catalogue of good practice

The data presented within Chapters 4 and 5 predominantly took the form of individual narratives from stakeholders involved in the reconstruction. To better process and summarise this data, and present the patterns that the data offers, a catalogue of all of the challenges, related contexts and good practice was produced (provided in Appendix H). As discussed in Chapter 5, each individual report of a challenge could be cross-referenced to the context in which it occurred, and any good practice that was implemented to reduce the challenge. These individual reports were grouped into the six challenge categories (accessibility, labour, land, government, community, and materials). Within these categories, the individual challenge reports were grouped into similar themes, for example: the specific challenge of seasonal roads causing delays within the accessibility challenges, or the time consuming, complex approvals process within the government challenges. From this, based on the individual narratives, it was possible to identify the full range of contexts reported in which each sub-challenge occurred, and all the good practice that was reported to mitigate or reduce the sub-challenge.

This catalogue also provides a measure the frequency of reporting of sub-challenges and good practice, between high-level and case-specific participants, as well as comparing the number of participants reporting a challenge versus reporting a corresponding good practice to reduce the challenge. This can be used to highlight challenges for which good practice has been less implemented, as well as measuring the confidence in an item of good practice. There are some items of good practice that were reported by multiple participants, evenly distributed between those with high-level and case-specific involvement; this provides greater confidence in the applicability of this good practice, particularly as high-level reports can indicate better generalisation across multiple projects, while being backed up by implementation within individual projects.

For 60 percent of the distinct items of good practice identified, they were reported by only one participant, and there are also examples of good practices that were solely, or more prominently reported by either high-level or case-specific participants. These are still valid findings and represent items of good practice that have been recommended by a stakeholder involved in school reconstruction in Nepal, although this may indicate that these items of good practice are more specific to a small sub-set of contexts. However, it could also suggest that the use of these items of good practice is less common, or that they are less well-known, particularly at either a case-specific or high-level involvement; this could indicate a good area for growth, to increase familiarity with these items of good practice and broaden their implementation.

Similarly, for 20 percent of the distinct good practices, more participants reported experiencing the related challenge, than the number reporting the implementation of good practice that could overcome or mitigate the challenge. This indicates that there are gaps within the delivery of school reconstruction projects, and a lack of knowledge transfer for all stakeholders to be able to implement effective good practice to reduce all the challenges faced. These scenarios highlight the need for a tool to assist with this process, enabling stakeholders to identify suitable good practice that has been used within other similar contexts. However, care should be taken with all the good practice recommended, as while they have been seen to be appropriate in the contexts identified, stakeholders should still assess their applicability within any individual project, to ensure they are practical and necessary.

6.3. Decision trees

While collating the individual narratives from the interviews helps to process this vast quantity of data, it is still difficult to fully comprehend the intricacies of relationships between the challenges, contexts and good practice. This is better represented graphically, and as such, decision trees were produced, based on the information provided in the catalogue. Decision trees were made for each of the six challenge categories. Collectively, these six decision trees depict the full spectrum of contexts identified and include all the items of good practice that were reported within the interviews. These are shown in full in Appendix I, noting that these have been updated following the validation exercise (discussed in Section 6.5.). These updates have been informed by researcher observations and complementary research activities, amd provide greater specificity to the items of good practice, for example giving clearer indication of who is responsible for an action, or providing specific suggestions of how an action could be implemented, or what factors should be considered.

Table 6-1 - Examples of updated good practice provided in the decision trees (not exhaustive of all changes - for fully updated decision trees, refer to Appendix I)

Initial good practice:	Updated good practice:
Outline requirements for school facilities to designer/engineer	(For schools/SMCs) Outline requirements for school facilities to designer/engineer, working with them to establish feasible design within project constraints (budget, space, ground conditions etc.)
School had limited involvement, due to funding mechanism – organisation oversaw all aspects.	Tri-partite agreement between the organisations (NGO, INGO etc.), the CLPIU and the NRA. Hire contractors or work with community etc. to complete the work. School has limited involvement, although should be consulted on design requirements, to improve ownership and ensure design is fit for purpose.
Ensure necessary permission is sought for all aspects of work e.g. cutting down trees	All necessary permissions (sought from relevant bodies e.g., Ministry of Forests) must be in place for all aspects of work, before work commences (e.g., cutting down trees within construction site, sourcing local materials, land ownership both onsite and on access routes)
Assess whether there will be any additional	Assess and mitigate whether there will be any additional challenges caused by the monsoon (e.g., local flooding, material storage, affecting ground conditions on site, delaying or affecting

challenges caused by the monsoon	quality of construction). Make use of local knowledge within community and from school stakeholders to advise on history of impacts at/near the site.

Each decision tree is made up of a series of branches, such as the one shown in Figure 6-1. These are formed of three key elements. Firstly, the school reconstruction process was broken down into all the decisions and considerations that must be made (as identified by interview and study participants), in order to complete a school reconstruction project. By working through all of these decisions, a full picture of a specific project context can be established, accounting for all of the factors that may influence project delivery. Each branch details one of these decisions (depicted in blue) that must be considered, to progress the project to the next step, and indicates a potential trigger for a particular sub-challenge. Secondly, for each of the decisions, the range of potential responses have been identified from the study results. These are depicted in orange in the decision trees and collectively should represent the full spectrum of possible project contexts. Thirdly, for each individual branch, the appropriate good practice for that case is provided (shown in green). This is based on the sub-challenge (related to the decision, in blue), and the specific context (in orange), identifying the relevant good practice from the catalogue. A preliminary version of these was completed, to be tested within the validation exercise. However, it should be noted that subsequent work following the exercise, has been conducted, providing greater specificity to some of the good practice. These updated good practices still have the same roots and are based on the good practice reported by Phase One and Phase Two participants, but have been improved using researcher observations and supported by the complementary research activities.

An example of a decision tree branch is provided in Figure 6-1 (note that this is taken from the original decision tree, that was included within the validation exercise). This outlines the consideration of the level of accessibility of the project site (shown in blue). The possible options identified (in orange) range from locations within Kathmandu, through worsening quality and limited availability of roads, to locations that have no road or vehicle access. For each option, the appropriate good practice is provided (in green). These include assigning an accessibility rating for the site, as well as additional actions for harder to access areas, such as allocating additional resources to cover higher transportation costs, and using lightweight materials to reduce the difficulty of transporting them. The route selected within this branch then informs further factors and decisions that much be made (outlined in subsequent branches), such as the availability of materials, the transport of materials, and access to skilled labour.

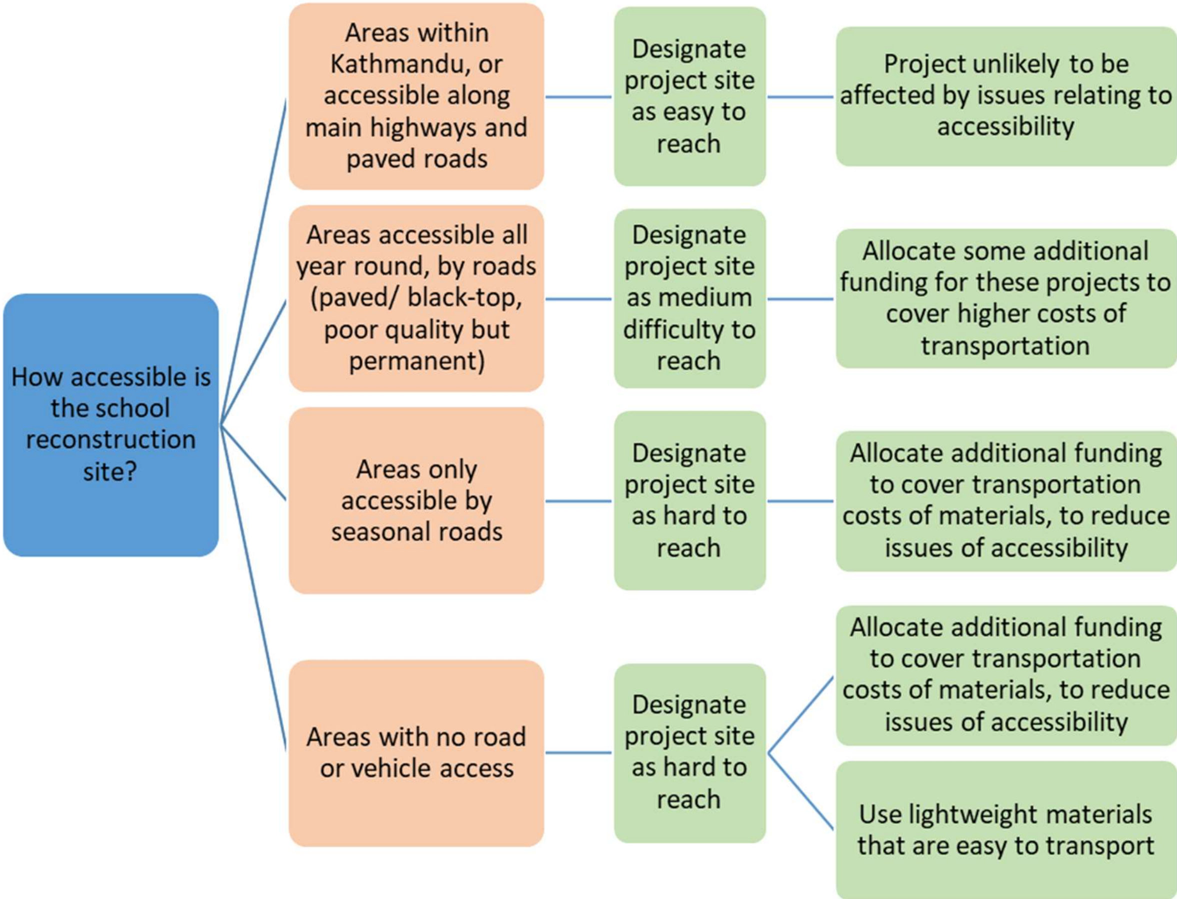

Figure 6-1 - An individual branch of the original decision tree. This branch shows the judgement of how accessible a school is, based on its location and the road provision to the site, within the accessibility and transportation challenge category. Blue depicts questions that must be answered, orange depicts the different options, to classify an aspect of the project's context, and green represents the appropriate good practice for that specific context.

In total, 137 distinct items of good practice were identified within the interview results; a summary of the number within each challenge category is provided in Figure 6-2. However, as many of these good practices cover multiple contexts, when shown within the decision trees, in some cases the wording varies to account for the specific context it is applied to (e.g., for a specific stakeholder role). The quantity of good practice provided on each branch also varies. For some, a follow-on decision is needed to best identify the relevant context and appropriate good practice; some may require only one or two items of good practice; whereas for others, there may be several items of appropriate good practice, indicating multiple actions that can be taken to reduce the challenge encapsulated within the branch. There were also three instances of challenges or contexts for which no good practice was recommended, and for these, logical good practice has been recommended based on inferred good practice by participants, or on individual judgements made by the researcher. These are shown in yellow within the decision trees, to highlight these good practices separately from those that were directly identified by participants, as there is no measured certainty of their suitability.

Figure 6-2 - A count of the total number of individual items of good practice to be included in the decision trees, within each of the six challenge categories.

As well as the vast array of good practice, the decision trees account for a large range of contexts. In Table 6-2, a count of the total number of routes through each of the six decision trees is provided, indicating each of the possible full contextual scenarios depicted. For some, such as accessibility, and labour, the number of possible pathways is relatively small (11, and 12 respectively), while for others there are many more, particularly within the community decision tree, with 272 potential routes. It should be noted that, although the decision trees have been produced separately, some decisions will be mirrored across multiple decision trees, where factors influence multiple challenges.

This highlights the full complexity depicted within the decision trees, providing many different items of good practice, for a broad range of possible project contexts. This is best shown in viewing the full decision trees, which are provided (with the updated good practice) in Appendix I. However, further examples of individual branches (taken from the original decision trees, as these are the ones that were used within the validation exercise) are provided in Figure 6-3 to Figure 6-8, demonstrating a small portion of the range of good practice and contexts available. For each of these, a summary of the levels of reporting of each of the items of good practice is provided (in Table 6-3 to Table 6-8); this provides insight into the level of acceptance amongst interview participants, the confidence in the good practice, and the potential to broaden implementation of it amongst more stakeholders and within more projects.

Table 6-2 – A count of the total number of potential routes through each of the six decision trees. These represent the range of possible contextual scenarios depicted, relevant to each of the six challenges.

Challenge	Number of context scenarios
Accessibility	11
Community	272
Government	54
Labour	12
Land	61
Materials	33

6.3.2. Accessibility and transportation

Figure 6-3 shows one branch of the accessibility and transportation decision tree. This outlines the consideration of suitable storage space for construction materials at a project site. As shown in Table 6-3, the two items of good practice had different levels of reporting (one and three respectively), indicating greater confidence in, and more frequent implementation of, the practice of planning work to avoid the monsoon season. For both items, there were more reports of the associated challenge (a lack of safe/suitable storage) than reports of the good practice, indicating that there is a need to more widely adopt these practices, to reduce the impact of this challenge.

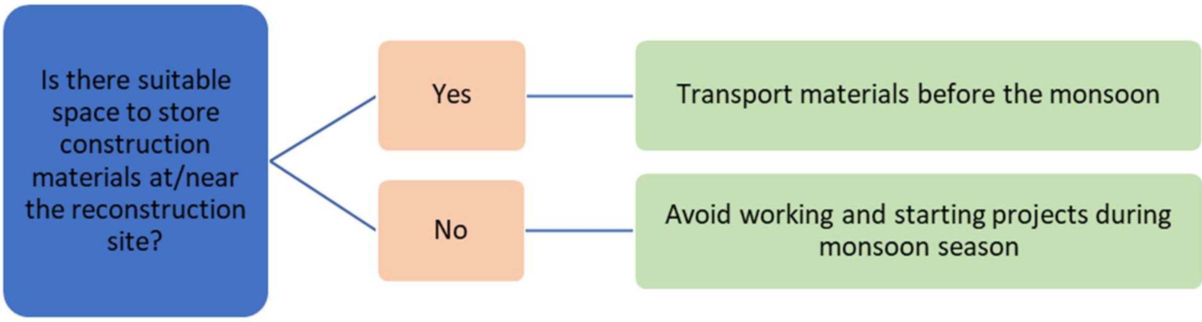

Figure 6-3 – One branch of the accessibility decision tree, assessing the storage available at the site, following the consideration of seasonal roads, which can impact on feasibility of transporting materials.

Table 6-3 – The levels of reporting of the good practice identified in accessibility decision tree branch shown in Figure 6-3. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable.

Item of good practice	Good practice reports			Total challenge reports
	High-level	Case-specific	Total	
Transport materials before the monsoon….	0	1	1	2
Avoid working and starting projects…..	1	2	3	6

6.3.4. Community involvement

Figure 6-4 shows a branch of the community involvement decision tree, identifying good practice for different stakeholder roles, and the associated levels of reporting are provided in Table 6-4. In this case, multiple items of good practice are provided for each specific context, with reports from at least five participants. These good practices also appear more widely implemented, with smaller disparity between reports of the challenge and good practice.

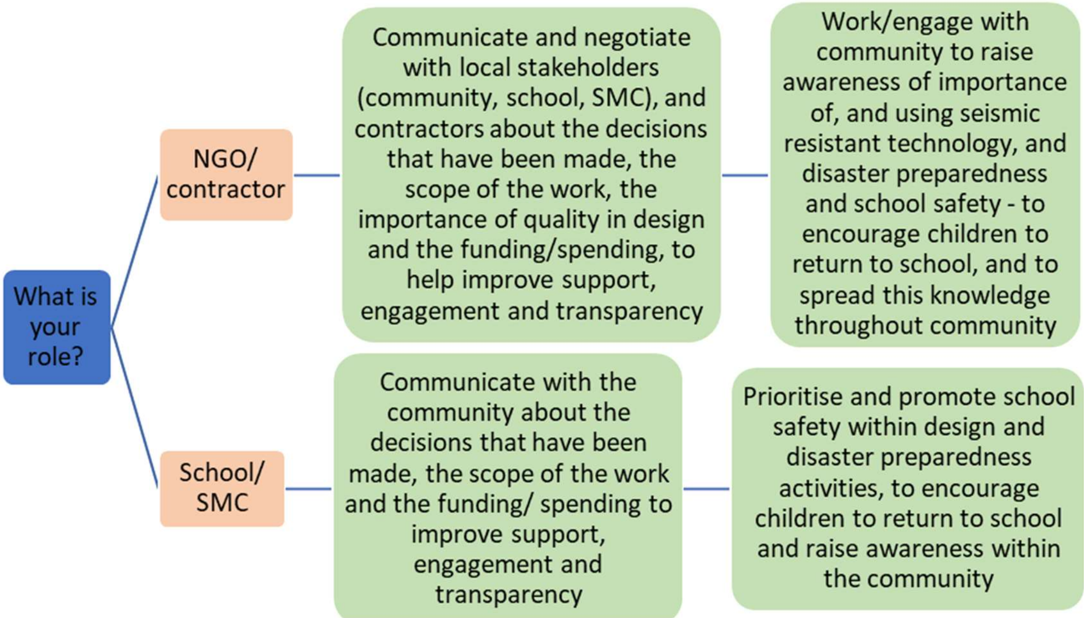

Figure 6-4 – One branch of the community involvement decision tree, detailing communication practice for different roles.

Table 6-4 - The levels of reporting of the good practice identified in community involvement decision tree branch shown in Figure 6-4. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable.

Item of good practice	Good practice reports			Total challenge reports
	High-level	Case-specific	Total	
Communicate and negotiate…	3	2	5	7
Work/engage with community….	3	3	6	6
Communicate with the community….	3	2	5	6
Prioritise and promote school….	3	3	6	6

6.3.6. Quality and availability of materials

In Figure 6-5, a branch of the materials decision tree is provided, considering the provision of construction materials, dependent on whether multiple projects are being conducted in an area. Levels of reporting (shown in Table 6-5) were low (only one or two), although were consistent with the number of challenge reports. This suggests that while the challenge was not frequently experienced, where it was, effective good practice was implemented.

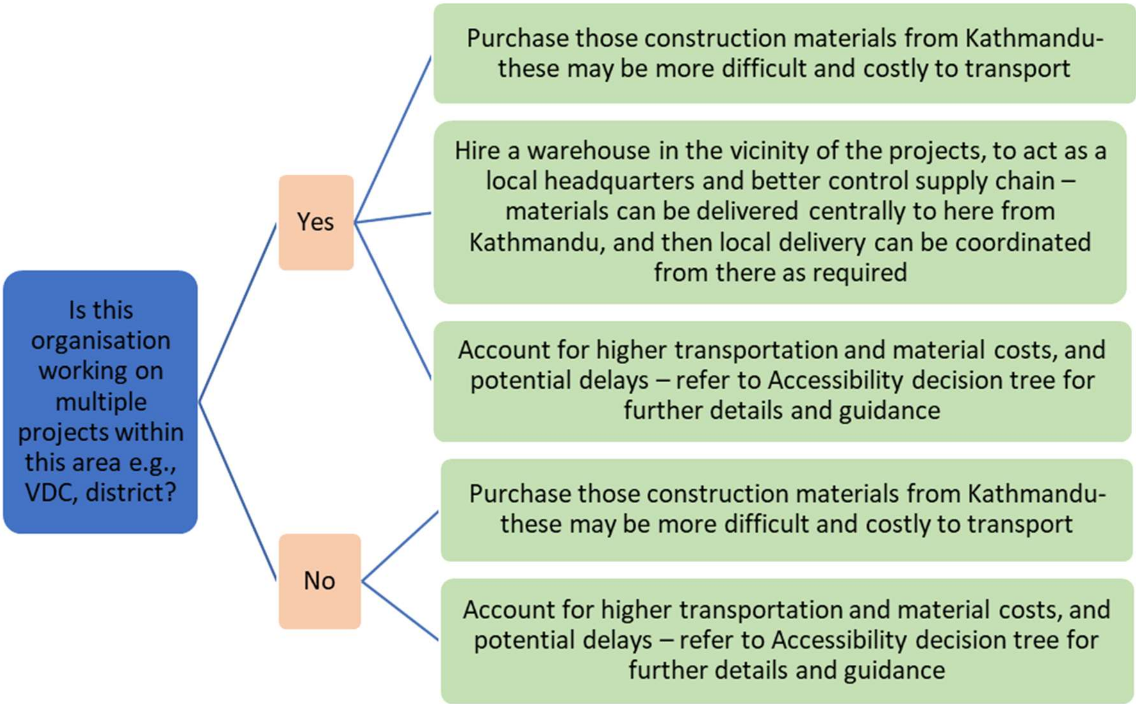

Figure 6-5 – One branch of the materials decision tree, depicting the good practice for sourcing materials, dependent on broader involvement in projects in the same region.

Table 6-5 - The levels of reporting of the good practice identified in materials decision tree branch shown in Figure 6-5. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable.

Item of good practice	Good practice reports			Total challenge reports
	High-level	Case-specific	Total	
Purchase those construction materials…	0	2	2	2
Hire a warehouse in the vicinity….	1	0	1	1
Account for higher transportation….	1	0	1	2

6.3.8. Suitability and availability of land

Figure 6-6 provides good practice based on the availability of water near to the construction site, with the level of reporting provided in Table 6-6. This shows significantly different approaches to project delivery based on the context, either adapting the project scope to extend the water supply to the school, or adapting the choice of materials and design, if it is unfeasible to provide a nearby water source. As with the example above (in Figure 6-4), there were low but consistent levels of reporting.

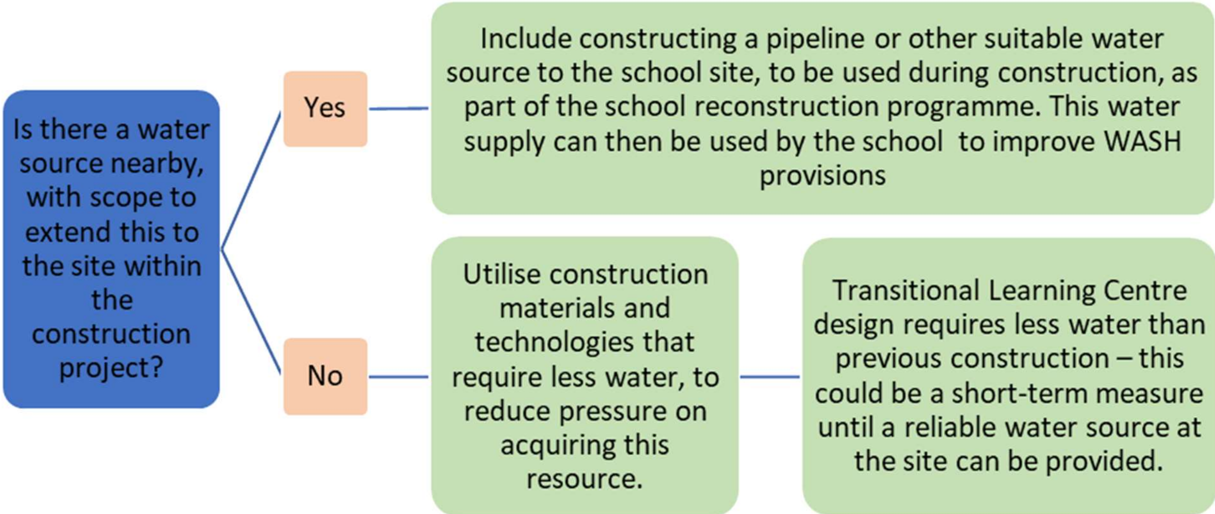

Figure 6-6 – One branch of the land decision tree, depicting the good practice dependent on the availability of a water source near the site.

Table 6-6 - The levels of reporting of the good practice identified in land decision tree branch shown in Figure 6-6. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable.

Item of good practice	Good practice reports			Total challenge reports
	High-level	Case-specific	Total	
Include constructing a pipeline....	0	2	2	2
Utilise construction materials....	1	0	1	1
Transitional learning centre design....	1	0	1	1

6.3.10. Skill and availability of labour

In Figure 6-7, the decision regarding the timing of multiple projects is considered, and the levels of reporting for the associated good practice is provided in Table 6-7. The with previous examples, the levels of reporting are low, although consistent between challenge and good practice reports. In this case, there were no reports from case-specific participants (although this could be expected, as these perspectives considered individual rather than multiple schools). However, as reports were from high-level participants, this indicates a more generalised acceptance of these good practice, from broader involvement with school reconstruction in Nepal.

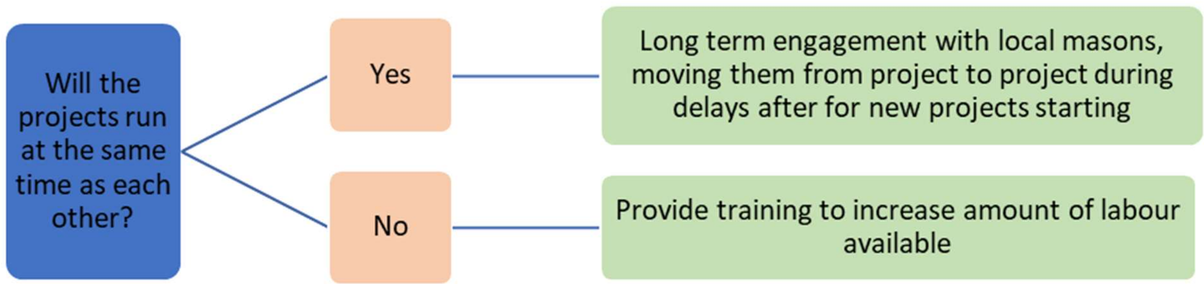

Figure 6-7 – One branch of the labour decision tree, depicting the good practice for engaging labourers across multiple projects, dependent on the timeframes of the projects.

Table 6-7 - The levels of reporting of the good practice identified in labour decision tree branch shown in Figure 6-7. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable.

Item of good practice	Good practice reports			Total challenge reports
	High-level	Case-specific	Total	
Long term engagement….	2	0	2	2
Provide training….	2	0	2	2

6.3.11. Government processes

The final example, shown in Figure 6-8, shows two branches of the government processes decision tree. In this case, a further decision was required for government stakeholders before appropriate good practice could be identified, depicting how the decision trees flow from one decision to the next. The levels of reporting of good practice are provided in Table 6-8; these show a variation in reports between the different items of good practice (one versus four reports). This suggests greater confidence in the practice of implementing multiple levels of checking throughout construction, while there is greater scope for effective knowledge transfer of the less frequently reported good practices.

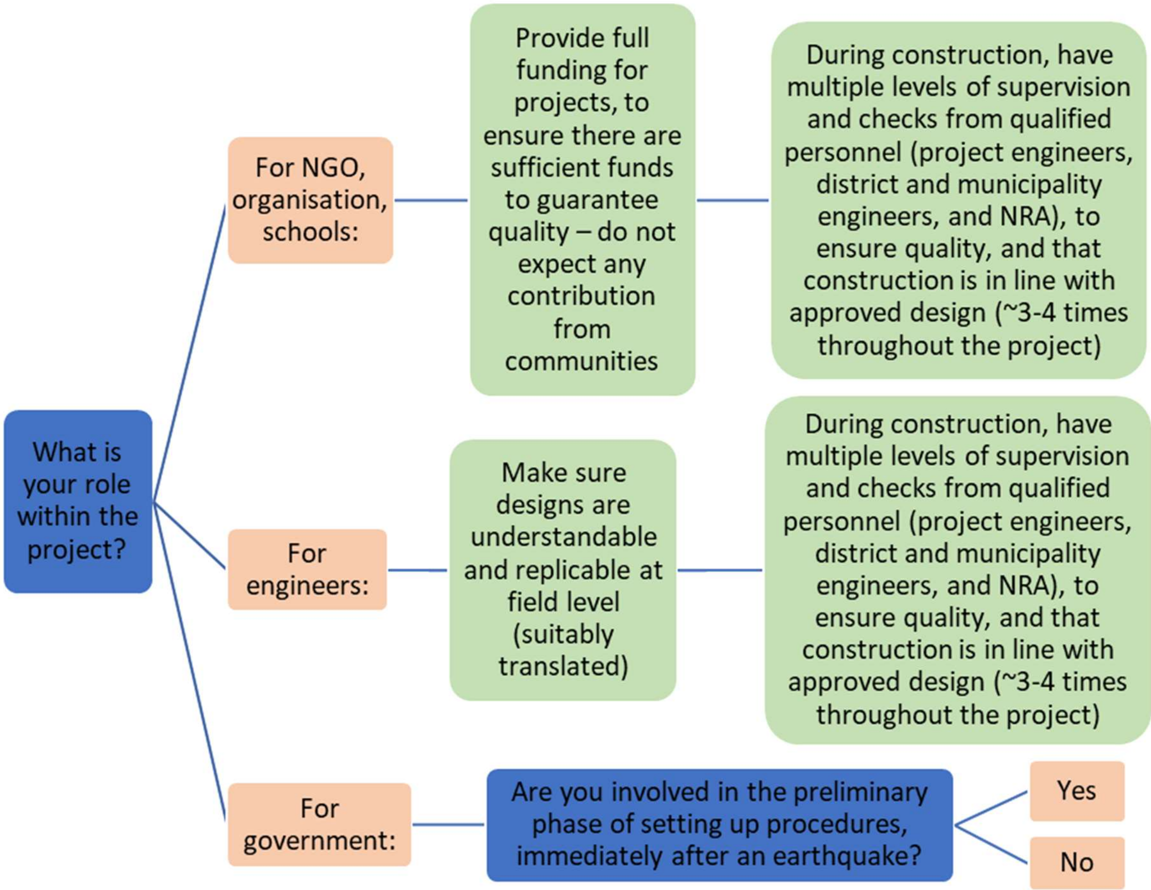

Figure 6-8 – One branch of the government decision, depicting responsibilities and good practice dependent on the role of the stakeholder, including a subsequent branch for the government stakeholder response, assessing immediate involvement with schools immediately after an earthquake.

Table 6-8 - The levels of reporting of the good practice identified in government decision tree branch shown in Figure 6-8. This shows the number of reports from both high-level and case-specific participants, as well as the number of reports of the associated challenge for which the good practice is suitable.

Item of good practice	Good practice reports			Total challenge reports
	High-level	Case-specific	Total	
Provide full funding….	1	0	1	1
During construction, have….	2	2	4	4
Make sure designs are…..	1	0	1	1

6.4. Decision-making framework

While the decision trees provide a valuable graphical representation of the results of this research, this still presents a complex process to work through, with many branches to follow and understand. Therefore, the six individual decision trees, in series, can be used to produce a decision-making framework that breaks down the full decision trees into a systematic set of decisions that must be made to complete a school reconstruction project. From this, users can identify appropriate good practice for a specific project they are involved in, in order to improve project delivery. However, it is important to note that while generalisations have been carefully considered when identifying good practice within the framework, the recommended good practice should be assessed by the stakeholders, to judge the suitability. This is particularly important as no two schools or general perspectives could accurately represent precise individual school contexts.

6.4.1. Intended users

This framework is aimed at stakeholders involved in school reconstruction projects within Nepal and would be most beneficial for those directly involved in project implementation and delivery. While certain aspects of the framework would be beneficial to all stakeholders, as detailed in Chapter 5, each stakeholder plays a different role within projects. This alters the information they would need, or want, to obtain from using the framework, and the areas of the framework that would be relevant to them. To evaluate this fully, profiles of potential users were considered, based on the observations and data collected within the pilot and phase two studies. The summary of this evaluation is shown in Table 6--9.

This evaluation identified the key stakeholders who may find this framework beneficial, and the typical roles they play within projects. Based on this, the needs of each stakeholder were considered, identifying what information they would be trying to find, and their requirements for the framework, in order to fulfil their role. This informed the likely tasks they would then be completing within the framework, and the key information they would input, for their specific areas of involvement and experience. While the framework should allow for significant diversity in the range of potential inputs, due to the complexities and variety of project contexts, it is not possible to fully represent each individual school reconstruction for Nepal. Therefore, user frustrations were also considered, to highlight specific areas where these may be significant.

This user evaluation was used when producing the framework, to account for the different pathways that were required to meet the specific needs and roles of each stakeholder group, and address and limit the potential areas of frustration that were highlighted. The evaluation can also be used to inform and measure the success of the framework, and as such, key components of the needs, tasks and frustrations are considered within the validation exercise discussed in Section 6.5.

As well as accounting for each stakeholder group who may use the framework, it is important to highlight the three modes for implementing school reconstruction projects in Nepal. These have been considered when producing the framework, including how these affect the specific roles of stakeholders, and this framework is therefore suitable for use within each mode. Firstly, projects funded and coordinated by the government, led by contractors. While not the primary purpose, the framework could be used within government to assist in identifying suitable materials and good practices for project contexts, and therefore allocating suitable organisations and contractors to these projects. Contractors could also use this framework to identify good practice that could be used within the design and delivery of the project.

For smaller projects, the second mode of implementation is through equipping school management committees (SMCs) to manage the projects, in partnership with an organisation to provide technical assistance. This mode represents approximately 75% of all school reconstruction efforts, and is therefore likely to be a large target demographic for the framework. Additionally, particularly as these projects are often conducted in isolation, at an individual school level, where there is less potential for knowledge transfer, there are greater potential benefits of implementing the framework within this mode. This also presents an interesting case, as SMCs usually have much better local knowledge, and a better understanding of the requirements of the school, but generally lack the technical capacity and project management experience to effectively manage the project. The framework would be beneficial for both the SMCs with the project management aspects, and working through the initial stages of the project, identifying project sites, and detailing the design requirements. It would also be beneficial to the project partners such as the NGOs delivering the technical aspects of the projects, such as the engineers completing the design and providing any training and supervising construction.

The third mode of implementation is through philanthropic organisations and donations, generally working through NGOs to implement and manage projects. While not directly applicable, those involved in funding of projects, either within NGOs or providing the money to NGOs may find the framework beneficial, to understand the different contexts, materials and good practice that may be suitable, especially if the money is allocated to a specific community, district or type of school. As with those involved with the SMC mode of implementation, the NGOs and contractors managing and coordinating constructing in this mode would also find the framework of particular benefit, to assist in identifying good practice that could be relevant at each stage of the project.

For each of the three modes of implementation, it is best to use this framework at the start and early stages of a school reconstruction project, to provide good practice for project initiation, site selection and design, as well as the delivery of construction. However, it would still have some benefit if used in later stages of a project, to better inform ongoing construction and particularly the wider benefits that can be achieved through the project.

Table 6--9 - User profiles for the decision-making framework, identifying the stakeholders who may use the framework, the roles they have within projects, the information they need when completing their roles, the tasks they would therefore perform within the framework, and potential sources of frustration they could have with the framework.

Stakeholder	Role	Needs	Tasks	Frustrations
Funder	A donor (private, aid, corporate, NGO), providing funds for a school reconstruction project	To identify a school or location to work with, if funding is generic To identify suitable materials for a specific school or location, once selected To identify potential suitable partners for a specific school or location, once selected To identify potential requirements to set, in order to help shape projects and ensure quality	Input information about budgets and the number of schools to be constructed Input location information for any preferred locations to work in (if known) Input information about experience of work in this area, and background of the funder	Not enough flexibility for the range of funding sources, so solutions not specific/relevant enough Not able to provide enough information for the different criteria, if little information known, or little experience in this area Too many options provided, so not able to effectively narrow down potential routes to follow
Engineer	An engineer (either independent or within an NGO/contracting organisation) looking to design a new school reconstruction, and oversee site supervision/ training where required, assuming a known	To identify suitable materials for the site location To identify additional factors to consider within the construction (e.g. landslide hazard) To identify good design practice To identify good practice in site supervision and training mechanisms	Input location and accessibility information (distance from Kathmandu, road access to the site, road quality) Input site factor information (such as slopes, water sources, storage facilities) Highlight any links to other previous or ongoing reconstruction in the area Input information about the size and requirements of the school	Not having detailed enough information about the school to get specific solutions Receiving good practice that is too generic Only receiving one solution/option

	school/location has been selected			
NGO project manager	A project manager within an NGO, overseeing the implementation and delivery of a school reconstruction programme, assuming a known construction material	To identify relevant good practice for project delivery To identify relevant good practice for project coordination and initiation To identify potential sources for materials and labour	Input details of construction materials and design Input details of any known ongoing or previous reconstruction work in the area Input site location information (accessibility, hazards, road quality, water sources etc.)	If multiple members of an organisation using the framework for different aspects, having to repeat data entry Not having detailed enough information to complete forms Good practice provided either too vague or too specific, with too many or only single options Lack of data to provide details of nearby sources for materials or labour
School	A representative from a damaged/destroyed school, looking to initiate a reconstruction project	To identify suitable construction materials for the school location To identify likely costs of reconstruction, for the materials, location and size of the school	Input details of location and accessibility of the school Input details of school requirements (size, number of rooms etc.)	Too many or too few options for construction materials provided Not able to provide accurate costings for construction
School Management Committee	The School Management Committee for a school to be reconstructed, overseeing the project implementation and delivery	To identify suitable materials for construction, to inform selection of project partners To identify good practice for project coordination, and delivery	Input details of location and accessibility of the school Input details of site factors (water sources, storage facilities etc.) Input details of chosen construction materials and timings (if known)	Not knowing enough information to provide detailed responses Not receiving specific enough solutions for their context Solutions/good practice not being relevant to their context

6.4.2. Producing the framework

The decision trees form the basis of the prototype decision-making framework, which can be used to validate the research findings and relationships identified. Several options for the framework format were considered, outlined in Table 6-10, evaluating the advantages and disadvantages, to identify the most appropriate way to do this.

At this validation stage, producing the framework within Microsoft PowerPoint was the most appropriate option. This retained the graphical element of the decision trees, although added an interactive element, and the capability of breaking these down into individual branches, connected through hyperlinks to the subsequent branches; this makes it easier to work through systematically, and process the information and good practice provided for each decision. This is particularly important to allow validation participants to directly evaluate whether the recommended good practice was suitable for the decision and context considered. Creating a web- or mobile application was discounted, as this would require significant effort and resources which is not warranted before the efficacy of the framework has been validated. However, once validated, this is likely to be the most suitable format of the final framework and could be explored in future research, to broaden the dissemination and impact of this research.

To produce the framework, each branch of the decision trees is separated onto individual slides, showing a question/decision and the potential options for that decision, such as the one shown in Figure 6-9, and the full framework is available online here (Westoby, 2020). Each option is hyperlinked to the relevant follow up slide showing the appropriate good practice and the next follow-up question/decision if applicable. Having worked through each decision users would be taken to a slide containing a summary of all the relevant good practice that was suggested along the route that they followed, such as the one shown in Figure 6-10. At the end of each route within one decision tree and section of the decision-making framework, users can progress through to the next set of decisions from the next appropriate decision tree, for the next challenge to be considered.

Table 6-10 - Evaluation of the different potential framework formats

Framework format	Advantages	Disadvantages
Full decision trees	Simple and quick to produce, with little work required, having produced the decision trees	No interactive element All information presented at once, which may be hard for users to process effectively. Difficult to present concisely and neatly
Microsoft PowerPoint of individual branches, each hyperlinked to the next stage of the decision tree	No programming knowledge required. Presents the decision-trees systematically and graphically. Can be downloaded (as PPT or PDF) and accessed offline. Identify good practice systematically, throughout the process	Time-consuming to produce. No memory capability, for the framework to record and store previously inputted decisions
Online questionnaire, through a survey platform	Little programming knowledge required. Work through the decisions systematically Some memory capability to record previously inputted decisions	Time-consuming to produce. Available platforms would not offer full capability (either no conditional formatting for subsequent questions, or cannot automatically provide good practice based on inputs) Requires internet access
Web- or mobile based app	Could provide the best user interface. Could have memory capability to record previously inputted decisions, for multiple projects	Time-consuming Would require significant programming knowledge (beyond feasibility of this work) May require internet access.

While this systematic approach, working through each of the challenges, was selected, a number of other options for combining the framework were considered. The full evaluation of these options is provided in Appendix J. Retaining the six challenge categories within the six sections of the framework allows users to focus on specific relevant challenge areas, if these have been identified as prevalent for a particular project, or for their specific context and experience. However, the links between each of the sections are inputted, as this assists the user with navigating the full process of implementing a project; the individual sections have been ordered to best reflect the chronology of when each set of decisions must be made, to systematically work through the full decision-making process. This does however mean that there is some repetition of questions across multiple sections of the framework, where these decisions are relevant to multiple challenges, for example, the specific role of the stakeholder, or the location of the project affecting both accessibility and transportation and the suitability of different materials. However, attempts have been made to minimise this across each section to improve the overall user experience.

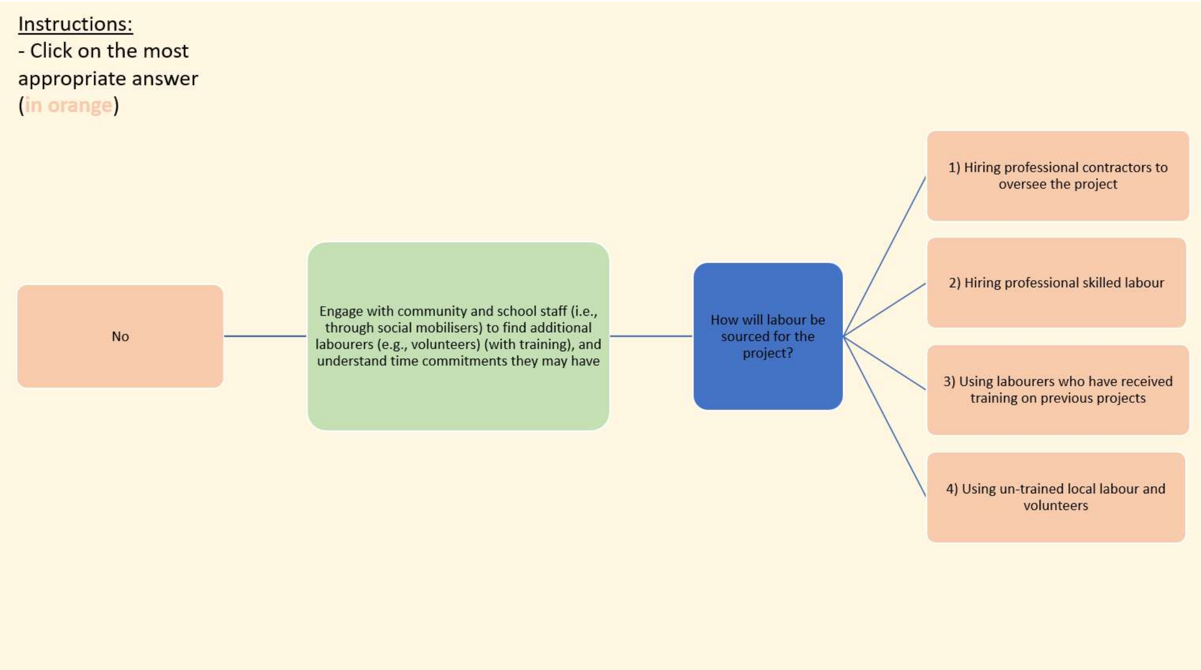

Figure 6-9 - Excerpt of the decision-making tool, showing one branch of the labour decision tree. This shows the good practice recommended for the option selected ('No') (from the previous question 'Will you be working of multiple projects in a similar area?'), followed by the subsequent question and potential answers from the decision tree up. The options are hyperlinked to the relevant slides for the recommended good practice and next follow up question.

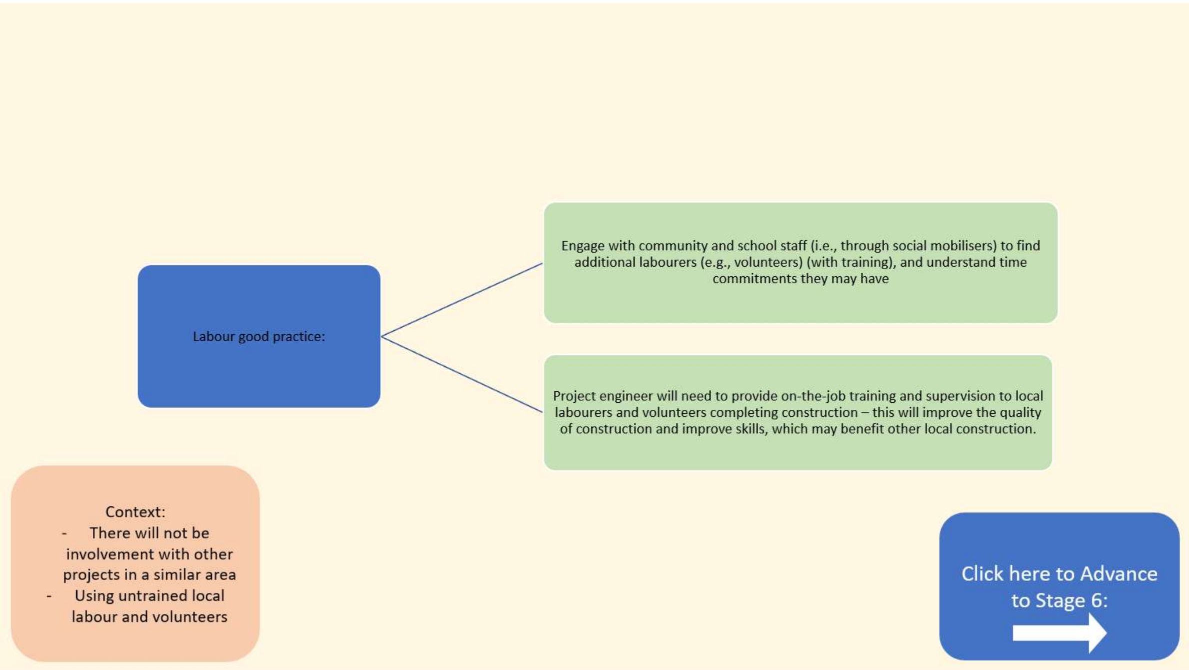

Figure 6-10 - Excerpt of the decision-making tool, showing the end of one route through the labour decision tree. This shows the summary of all the good practice recommended along the pathway, a summary of the context this is applicable to, and the hyperlinked option to progress to the next stage of the tool, considering the next challenge category.

6.5. Validation

Having produced the framework, based on the interviews conducted with stakeholders, it was important to validate it. This validation was to ensure that: 1) no bias or preconceptions have been introduced that negatively affect the framework, i.e. inaccurately recommending practices as 'good', 2) the framework accurately maps the range of project contexts that could occur (i.e., all the parameters and factors that can influence a project), 3) the good practice suggested is suitable and appropriate for the relevant contexts, particularly where less specific context information was provided and generalisations were made, and 4) the framework is functional, easy to use and fit for purpose, recommending useful good practice for the range of stakeholders who may use the framework.

6.5.1. Validation methodology

In order to validate the framework, it was trialled with a range of stakeholders, and their feedback collected. These stakeholders included both those who participated in the original interviews, to check that they felt it accurately represented their responses, and those who were new to this study, to provide wider validation of the framework's accuracy and suitability, based on different experiences than those who initially fed into the framework's production. Original interview participants were approached, as well as approaching other existing contacts, and new participants with whom there had been no prior interaction and who were new to the study, to complete the validation exercise. A snowball approach was also used, asking all these participants to identify additional stakeholders and participants who may also complete the exercise, in order to increase the number of participants, particularly to those it would be harder to access personally. While the success of this was limited, it did enable reaching some participants who otherwise would not have completed the exercise.

Due to Covid-19 related travel restrictions, it was not possible to conduct fieldwork in Nepal, as was done in phases one and two of this research. Therefore, an alternative validation methodology has been adopted, which was be conducted remotely. An online questionnaire format was chosen, for participants to work through individually, as this allowed for the most efficient collection of data, and ensured there was consistency in the exercise for each stakeholder so that results could be directly compared and analysed. This also enabled the most effective quantitative data collection, with participants able to discretely rank their experience and views, and highlight key features of the framework. While there was also space for participants to provide qualitative feedback, it did not allow for the dialogue between multiple participants or the researcher, and limited the amount of qualitative feedback given. Response rates were low in these qualitative questions, and is another area that could have been explored further within in-person workshops and focus groups.

To conduct the validation, 27 stakeholders were approached, resulting in nine participants completing the validation exercise; this provides a solid basis for the validation, and is similar in quantity to the number of participants in the previous phases of the research (ten in each). Of these participants, three had been involved in either the pilot study or phase two interviews, one had contributed to the additional research activities, while five had no prior involvement in the research. This provided a good balance of views, accounting for those whose experience had contributed to the framework, as well as those who would provide a fresh evaluation of the framework, to test its broader applicability. It was hoped to have more responses, to broaden the validation and have a greater level of confidence in the results; however, responses were likely limited in part due to the impact of Covid-19, and the impersonal nature of this approach. Participants were also asked to pass on the exercise to other appropriate colleagues and contacts, and while this reached one participant who otherwise would not have been included, this approach had limited success.

However, the nine participants who did complete the exercise presented a range of backgrounds and areas of experience, as shown in Figure 6-11, providing a good initial overview of the different stakeholder roles involved in the school reconstruction process. Despite approaching two within the initial 27, the one key group not represented are school or SMC participants. This is due to it being harder to approach this group directly, due to the language barrier, and many school representatives not having email addresses, or these not being accessible; therefore, contact was reliant on other participants making initial contact with partner schools. Consideration was given to producing and distributing a translated version of the questionnaire although this was deemed unfeasible within the timeframe of the work, particularly for the potentially low rates of completion. This is an area that could be given further thought in future work, outside the scope of this study. The greatest proportion of participants were NGO stakeholders, which was to be expected as this was the group that was easiest to access, coupled with a typically good level of English. This is positive, as it is reflective of one of the target demographics for the framework, representing those with most direct involvement in individual project delivery.

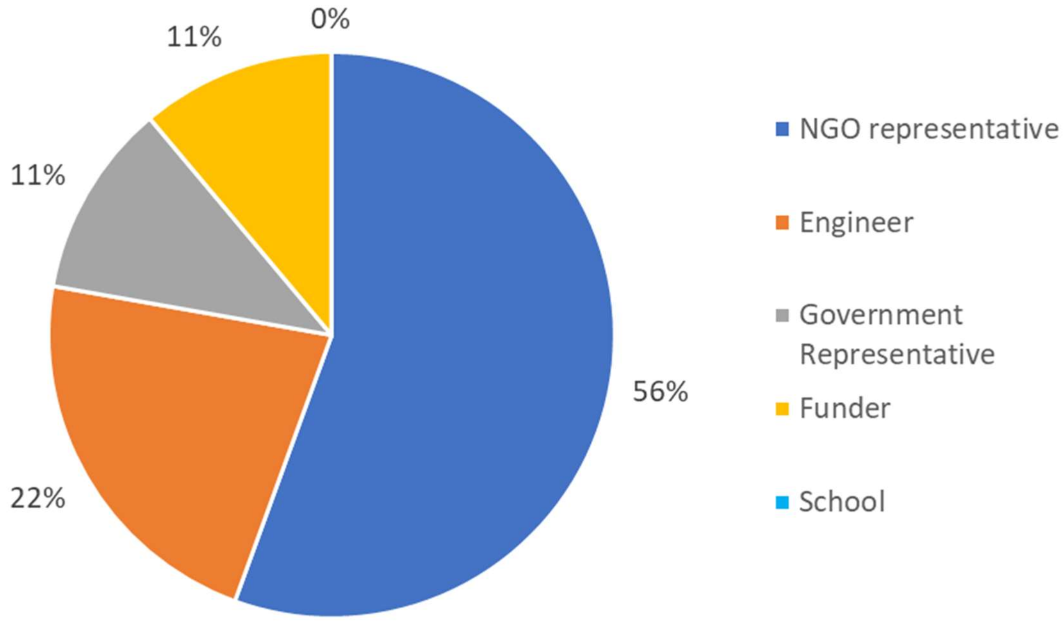

Figure 6-11 - The roles of the nine participants within the validation exercise.

6.5.2. Validation exercise

Participants were approached via email, providing an introduction to the framework and how it was created, an overview of the purpose of the validation exercise including assurances of anonymity within the process and how the data provided would be used, and guidance on how to complete the validation exercise. Within the email, participants were directed to the full decision-making framework, which could be accessed online, or downloaded to complete at a later date. Participants were asked to work through the framework, using a previous project as the basis for their selection of the project context (i.e., the relevant location, mode of implementation, accessibility, and size of the project). Each full route was given a unique identifying code which participants were asked to record, in order that their responses could be correlated to a specific project context.

Having worked through the full framework, a link was provided, directing participants to the online questionnaire to evaluate their experience. The full questionnaire is provided in Appendix K. The questionnaire covered four main aspects: whether they were able to accurately represent the project context; the suitability and appropriateness of the recommended good practice; the potential value of implementing the framework; and how easy the framework was to navigate. No questions were compulsory, so participants had the freedom to not answer anything they did not want to. The majority of questions within the questionnaire had a discrete set of answers that participants could choose from, to aid with the analysis process and ensure there was continuity across responses. Where relevant, there was also space to add additional options if the initial list was not sufficient. Each section of the questionnaire also ended with a free-text comment question giving participants space to detail any improvements or changes they would make to the framework, relevant to that area of interest. Responses to these free-text comment questions were limited, although there were some examples and suggestions offered.

The first section of the validation questionnaire focused on project context. Participants were initially asked to provide the scenario numbers they recorded when working through the framework, so that responses could be compared with the selected routes; however, it should be noted that not all participants completed this question, so this provided limited feedback. However, participants were also asked to give details about the context of their reconstruction project, including: their role, the project location, the accessibility of the site, the project implementation mode, the size of the project, the materials that were used, and the involvement of labour. For most of these questions, participants could choose answers from a list of options, or where relevant, add another not covered by the options. Participants were then asked to rate how well the framework could reflect the true project context, before detailing any changes that could improve how a specific context could be identified within the framework.

The second set of questions explored the good practice that was recommended. This included asking participants to rate how much of the good practice highlighted was used within the actual project, and even if not implemented, how much would have been suitable for the context, in order to measure the appropriateness and applicability of the good practice recommended for a given project context. Participants were then asked to detail changes that would improve the good practice identified.

Within the third set of questions, the value and impact of the framework were evaluated. Participants were asked to rate how helpful the framework would be if implemented within projects, as well as providing reasons for their answers. They were then asked to select the potential benefits using the framework may have for a project, before outlining changes that would improve the value and impact of implementing the framework.

The final set of questions focused on the functionality/useability of the framework. This included participants rating how easy or hard it was to navigate and use the framework, and the time it took to work through the framework. Lastly, participants were asked to detail changes that would improve the functionality of the framework, if it was being implemented within a school reconstruction project.

The results of the questionnaire were analysed using simple statistical analysis within the quantitative responses, supported by qualitative feedback providing more context for this. The quantitative responses were used to measure the efficacy of the framework: its value, suitability, and accuracy. The qualitative responses gave depth and understanding to the quantitative responses. These provided insight into the shortcomings of the framework, the areas that did and did not accurately represent the range of possible project contexts, and the suitability of the recommended good practice.

6.5.3. Validation results

A full summary of the results of the validation exercise is provided in Appendix L. While the number of responses was limited, the results of the validation exercise show are generally positive and show that, if implemented, the framework would bring benefits to projects.

6.5.3.1. Accuracy of project context

The first factor considered within the validation was how accurately the framework could reflect a specific project context. As shown in Figure 6-12, no participants reported that the framework was able to fully match the project context; however, four participants responded that they were able to mostly match the project context, and a further three reported that some key aspects matched but not all. This is positive, showing that for almost all participants, there was at least some similarity between their actual project context and the context they were able to select within the framework, allowing for appropriate good practice to be identified.

However, there were also two less positive responses, one participant reporting that there were only small similarities, and another reporting no similarities. The participant who reported that there were no similarities was considering a project in which earth bags were used for the reconstruction. However, this construction material is not represented as an option within the framework, as the government has stated (as reported in the phase two fieldwork) that earth bags are not approved for school reconstruction. Consideration was given to including earth bags as an option within the framework, acknowledging that this practice does take place; however, given that the framework should represent good practice for school reconstruction, this was deemed inappropriate and potentially misleading.

This is an area that may need more work to map out the full spectrum of project contexts more accurately. Unfortunately, there were limited responses within the validation exercise to indicate which contexts require improvement. Only three out of nine participants provided the scenario numbers indicating their selected contexts, limiting how many connections can be made between responses and participants' selected routes through the framework. Of the three who provided scenario numbers, one reported that most of the context matched the actual project context, and the other two reported that some key areas matched but not all. Comparing the given scenario numbers and reported project context, the results indicate that labour is a key area where improvements could be made within the framework, with six of nine participants reporting three or more different groups of labourers (e.g., professional contractors, external or local skilled labour, or local unskilled labour or volunteers) were involved in construction, but the framework cannot currently reflect this complexity. Another area where there was disparity was within the mode of project implementation, with two of the three responses not matching between the reported context and scenario number (selecting an SMC led route within the framework, but reporting an NGO led project within the questionnaire). This is likely to be because, as seen within the pilot study and phase two narratives, in reality stakeholder involvement can be complex, with projects not fitting neatly into one of the three reported modes (SMC, NGO or contractor led). This is supported by the only specific qualitative response given in this section, stating

'each project aspect is different with different workability of local govt (sic) standards so ideal cases don't always apply'.

While the framework is able to at least partially reflect an accurate project context, further work would be needed, in collaboration with stakeholders, to better reflect the complexities of this. However, care is needed that this does not over-complicate the framework, making it impractical to implement, as one participant also reported in this section that:

'simplification [is] needed'.

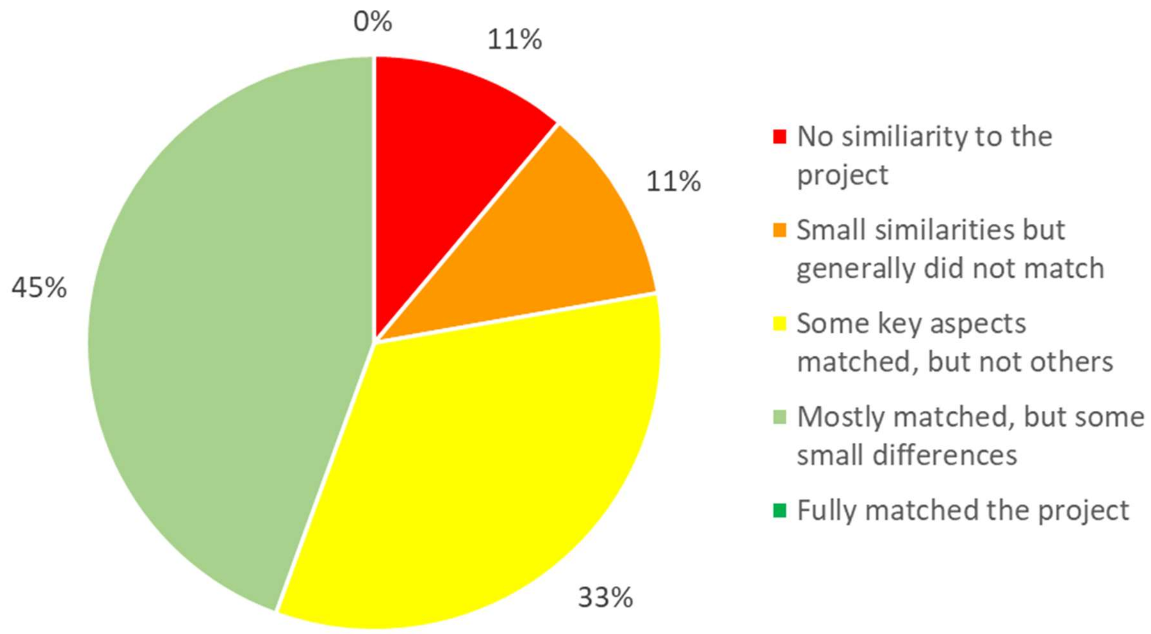

Figure 6-12 - Validation results showing how accurately the tool was able to match the actual project context.

6.5.3.2. Applicability of good practice

The second aspect of validation explored the applicability of good practice. This was considered in relation to how much of the identified good practice was actually implemented within the project delivery (shown in Figure 6-13), and how much of the identified good practice would have been suitable for the given context (shown in Figure 6-14).

As seen in Figure 6-13, there was a very high rate of implementation of the recommended good practice, with seven of nine participants reporting that all, or most, of the good practice was used, and one report that some of the good practice was used. This is a very positive result, showing a high level of applicability of the recommended good practice (supported by no reports that none of the good practice was used); this suggests that the process of cross-referencing project contexts and reported good practice within the phase two study was successful. While this could indicate that the framework is therefore unnecessary, it is important to note that the validation exercise was mostly completed by experienced practitioners, and implementation rates are likely to be much lower among other stakeholders (e.g., school or SMC representatives and less experienced NGOs).

As seen in Figure 6-14, seven of nine participants also reported that all, most, or some of the recommended good practice would have been suitable. This is a very positive response, indicating the applicability of the framework for Nepal's school reconstruction, recommending appropriate good practice. However, it is not clear why there were more positive responses indicating good practice that was implemented versus those that would have been suitable (with seven versus five participants reporting all or most good practice being implemented versus being suitable). It should also be noted that the one response of 'very little good practice would have been suitable' was provided by a participant in a CSEB project, who also stated that 'most of the good practice was used', suggesting a discrepancy in their response; there is no indication of why this was.

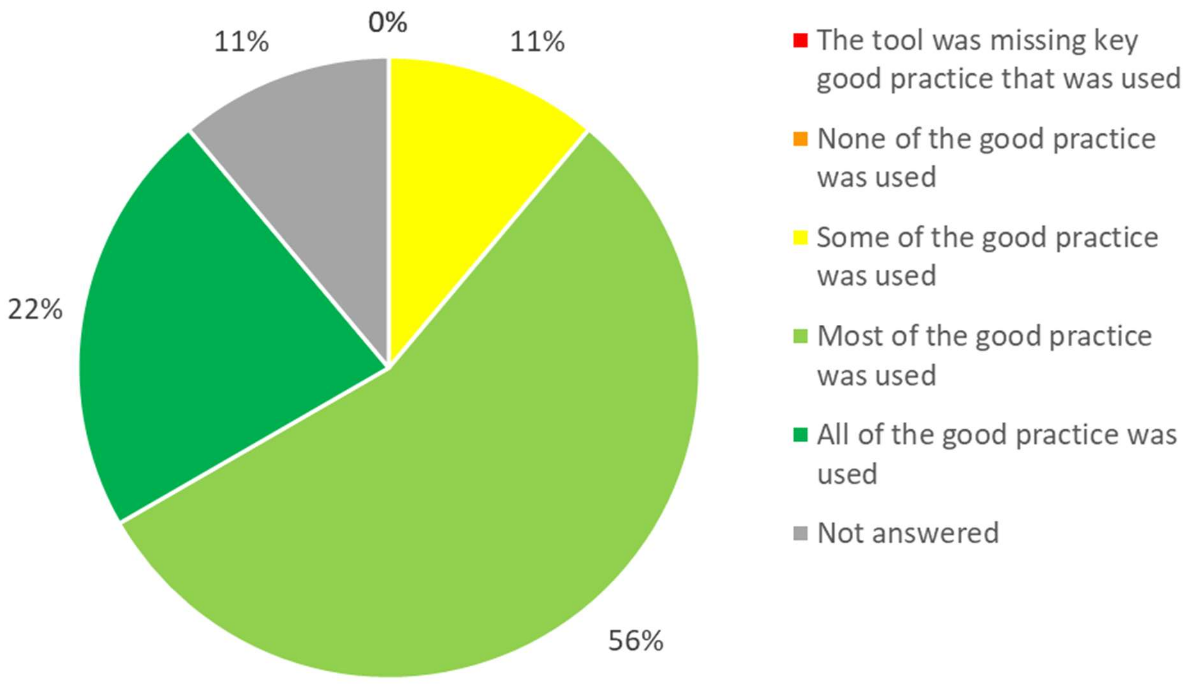

Figure 6-13 - Validation results showing how much of the good practice recommended within the tool was actually implemented within projects participants were considering.

Additionally, there were no reports that key items of good practice that had been implemented were not included within the framework. While the framework does not necessarily provide a comprehensive overview of every possible action that can be taken to overcome or mitigate challenges, it suggests that the framework does provide a thorough coverage of the range of actions that could be used. It is also important to acknowledge that, of the responses that 'all good practice' was used, one of these participants had contributed to the previous phase of research; while the validation suggests there was a high rate of implementation of the good practice, most responses indicated that there was some new good practice recommended that had not been implemented within the actual project, highlighting the potential for identifying new knowledge and increasing knowledge transfer by using the framework to aid project delivery.

There was one participant who did not complete these questions within the questionnaire. This participant was considering the earth bag school, and as discussed above, indicated that they were not able to accurately reflect the project context within the framework. This is therefore the likely reason they have not given answers in this section, having judged that much of the good practice would not have been applicable.

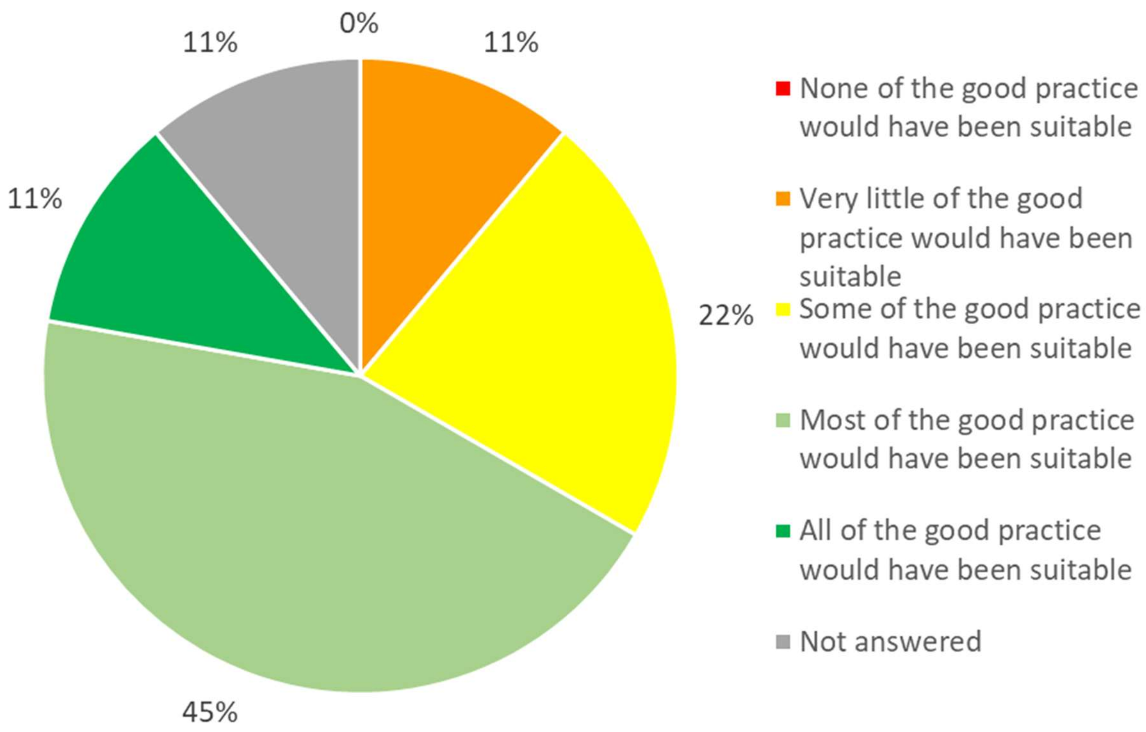

Figure 6-14 - Validation results showing participant ratings of how suitable the good practice recommended would have been within the specific project context they were considering.

6.5.3.3. Value of the framework

The third consideration within the validation was the value of the framework. The results (shown in Figure 6-15), provide a very positive response, with eight out of nine participants reporting that the framework would be beneficial; of these, six indicated that it is something they would use within projects, and two stated that while it would not be helpful for them, it could be beneficial for stakeholders with less experience. This suggests that the framework is applicable, with a need and a desire for a framework of this form, and that there is a feasible scope for it to be implemented, to assist with the delivery of ongoing and future school reconstruction projects in Nepal.

The two responses indicating the framework’s value for less experienced stakeholders is particularly positive, and especially relevant for the 75 percent of projects that are coordinated by SMCs who have little or no prior experience of managing construction projects and limited opportunity for gaining knowledge from other practitioners; this is a key context in which the framework could be particularly effective. This also highlights a recognition of the applicability of the framework, particularly within this key, and large stakeholder group. It would be beneficial for future work to explore practical ways to effectively implement this framework with stakeholders in Nepal, particularly SMCs, to increase the impact of this research.

As Figure 6-15 shows, there was only one negative response, indicating that the framework would 'not be at all helpful' if implemented within a project. As seen in previous sections, this response was given by the participant involved in the earth bag construction; this is to be expected given that the framework does not provide good practice for earth bag construction. This participant provided a free-text comment:

'Not useful for us I am afraid'.

However, they gave no suggestions of specific reasons why, or potential improvements to alter this; there could be potential for aspects of the framework to still benefit projects of this type (e.g., project management, stakeholder roles).

As well as rating how useful the framework would be if implemented within a project, participants were asked to identify the specific benefits the framework could have, from a list of options that had been identified within the pilot study as benefits of implementing specific good practice. There was also space to add others if relevant, although no participants provided any extras.

There was a positive response to many of the supplied benefits, as shown in Figure 6-16. These results correlate well with the reported value of the framework, highlighting a range of positive impacts of using the framework. Additionally, only the participant using earth bag school reconstruction reported the framework had none of the potential benefits. Of the remaining responses, it appears that these have been carefully considered, only selecting specific benefits, with only two of the nine participants selecting all the options available, which could have been perceived as the easiest way to answer this question; this provides greater confidence in these results, and in identifying the greatest benefits of the framework.

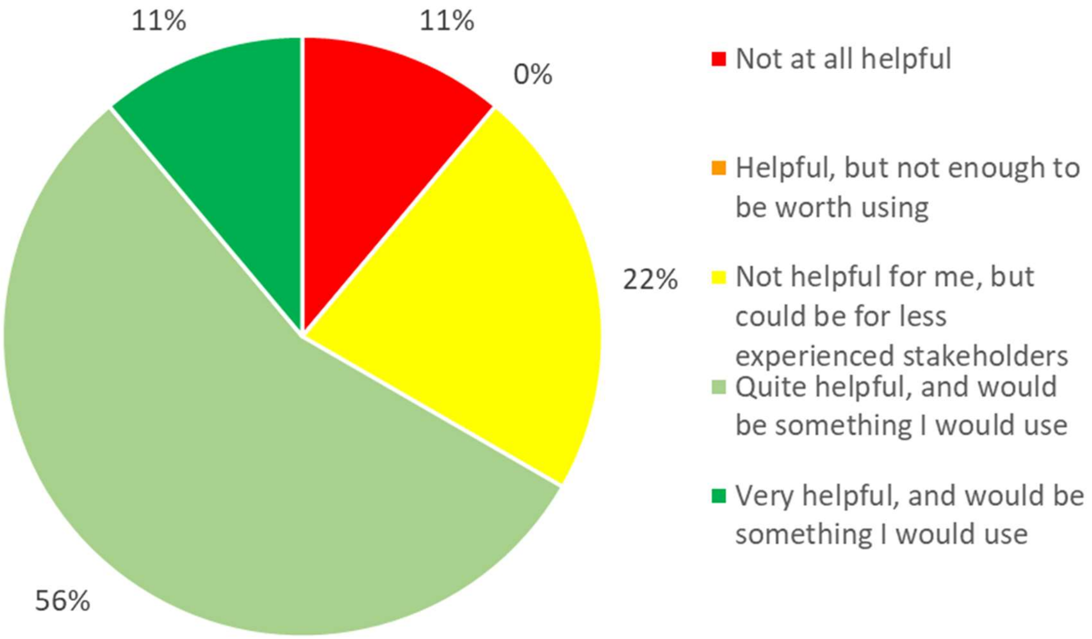

Figure 6-15 - Validation results showing participants ratings of how helpful the tool would be, if implemented within projects, either by themselves, or by other less experienced stakeholders.

The most common benefit reported (by seven out of nine participants), was that the framework would help to better manage and plan projects. While no reasons were offered for this in the qualitative responses, it could be expected that this is because it encourages users to consider each stage of the project in a coherent nature, working through each of the key decisions that must be made and the factors that must be considered.

Two of the other highest rated responses were the potential to provide additional benefits to school and community, and increasing the quality of construction, with six and five of nine participant responses, respectively. These are particularly important as they directly feed into Build Back Better and Build Back Safer efforts, working within reconstruction programmes to improve school facilities, (both seismic resistance, and quality and suitability of facilities), and improve resilience of school and community, for example by introducing technologies and better construction methods into communities, increasing earthquake preparedness awareness, and increasing awareness of the importance of seismic design.

The other highly reported benefit of the framework was the potential to reduce delays, with five out of nine participants reporting this. This is particularly positive as this directly links to the highest rated challenge category, accessibility and transportation, discussed in Chapter 5; much of the good practice was reported in relation to accessibility challenges that had led to delays in project delivery. This indicates that the framework has good scope to help overcome or mitigate even the most significant and common challenges facing school reconstruction projects.

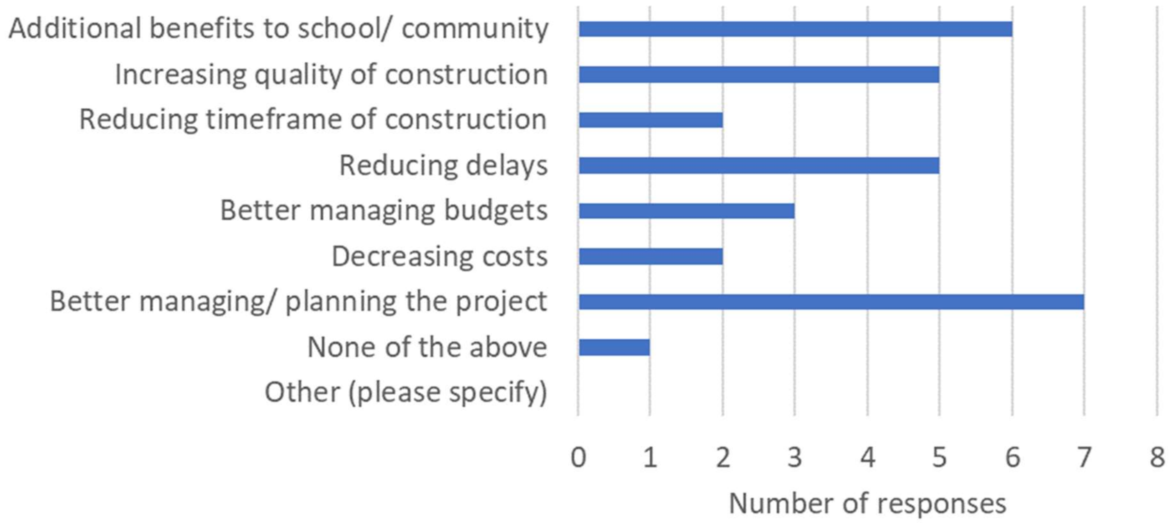

Figure 6-16 - Validation results showing the number of participants who indicated each of the options as a potential benefit of implementing the tool within a project (out of nine participants).

Of the other potential benefits listed, each were reported by at least two participants, suggesting that these would be achievable within at least a portion of projects, although these may be more dependent on the context of the project. One benefit is reducing the timeframe for construction. This is linked to reducing delays; however, shorter timeframes do not necessarily indicate a positive impact on project delivery (e.g., through poorer construction quality). Therefore, reduced timeframes may be a less likely benefit than reducing delays; however, it is possible that participants were more likely to report reduced delays as this is a clear negative for project delivery. The other two benefits are to better manage budgets and decrease costs. It is important to note that, as with the timeframe, better managing budgets, rather than decreasing costs, may be a better indication of success. While decreasing costs can be positive, this could also indicate a decrease in quality, and some of the good practice recommended could result in, or require, spending more money, for example, in ensuring that materials are of a high quality, paying more for skilled labour, or spending more time providing training where necessary. Therefore good practice to better manage and anticipate these costs, for example in assessing the level of accessibility to establish likely transportation costs, or assessing site quality for potential hazards that may need to be mitigated, can help to limit unforeseen costs being revealed throughout the project; this is important to ensure that the quality of construction can be maintained across the project, without facing unexpected challenges for which there are not sufficient funds to overcome them.

6.5.3.4. Framework format

The final factor considered within the validation exercise was the format and functionality of the framework, to assess how easy it is to navigate it. As shown in Figure 6-17, over half (five out of nine) participants indicated that the framework was easy (either moderately or very) to navigate, with an additional two participants stating that it was 'neither easy nor hard'. This suggests that for the most part, the framework format is good, and is easy and clear to follow. However, two participants reported that it was moderately hard to follow. Of these, one provided a comment indicating that the framework could be improved by:

'[removing] the looping back to the same [branch] once option is selected'.

This participant found that some links repeated, making it hard to exit the framework. within a discussion-based validation exercise (e.g., workshop/focus group) this could have been explored further, to understand whether this was the main factor that made it difficult to navigate, or if they also struggled with the overall format of the framework. However, further work is needed to reduce this issue for future users; this was highlighted by a participant who provided scenario numbers for their route through the framework, meaning that these specific links can be checked, although this should also be done throughout the rest of the framework.

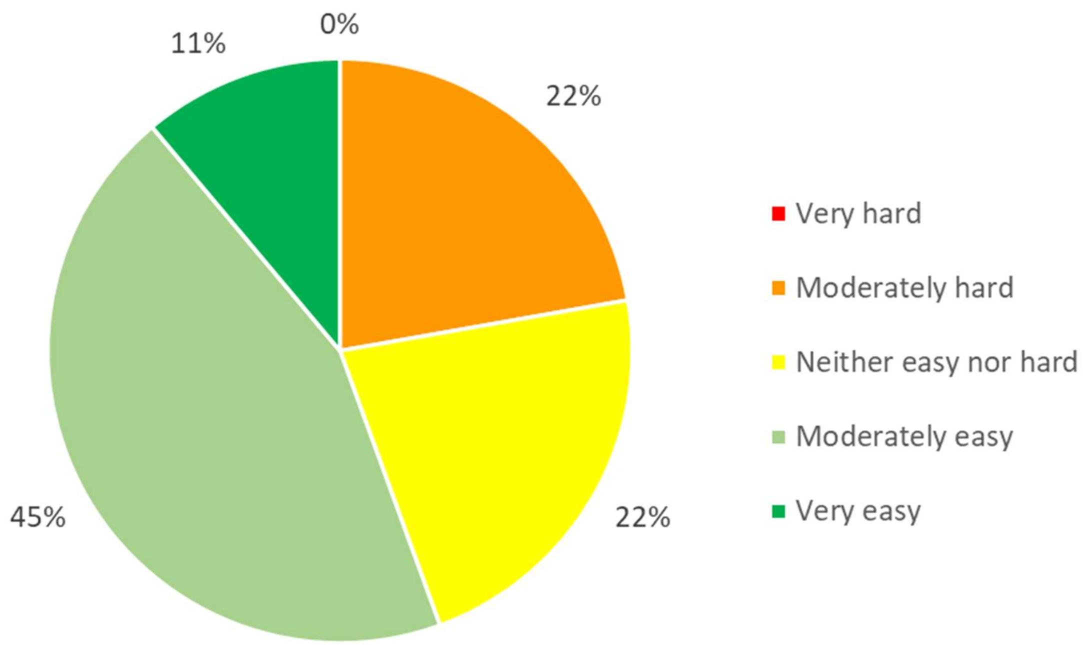

Figure 6-17 - Validation results showing how participants rated how easy or hard it was to navigate the tool.

As discussed in Section 6.4.2, (and shown in Table 6-10) a range of formats were considered for the framework (including an online questionnaire format, or a web or mobile application), opting for the PowerPoint/PDF format displaying the branches of the decision trees. Based on these validation results, it appears that in general, participants found that this format for the framework is suitable, although there is room to improve the flow between some branches. However, when also considering the length of the framework, the results, shown in Figure 6-18, could suggest that a different format may be beneficial, to reduce the length of the framework. Four out of nine participants reported that the framework was ‘neither too long nor too short’, suggesting that the framework took an appropriate length of time to work through. However, five of the nine participants reported that it was either moderately or much too long, which indicates that it would be beneficial to find ways to reduce the time required to work through the framework. Unfortunately, no areas where this could be done, or areas that were particularly long, were highlighted within the qualitative responses, although it may be indicative of the general format of the framework, with no specific areas being particularly problematic. The format of the prototype framework does have the capability to allow users to select individual sections to work through; however, this could be improved within an app format, better allowing users to interact with only the key sections they need.

Further work, beyond the scope of this study, should be done to explore the possibility of other framework formats. One shortcoming of the chosen format means that it is not possible to store memory of previous responses in previous stages of the framework; this means that there are currently some examples of repeated questions between stages, which are relevant to each, which increases the length of the framework. Different routes to reduce repeated questions could be explored in further work, including: re-ordering questions into a fully chronological system; or utilising additional memory capability within an app format. However, caution is needed, in order to maintain the possibility of viewing individual sections of the framework. This may be necessary for some users, for example, if undertaking a new project facing a particular challenge they had not faced before – e.g., moving from constructing in Kathmandu to a more remote location, where accessibility becomes a much greater challenge, or working in a community where it is more difficult to find a suitable site to construct on.

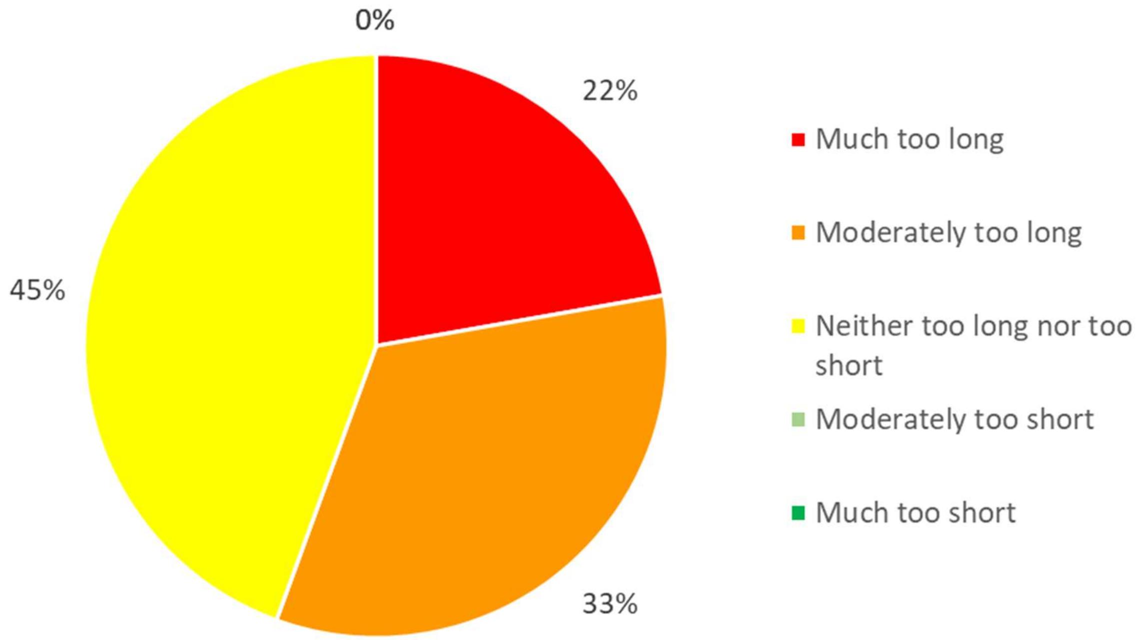

Figure 6-18 - Validation results showing how participants rated the length of time it took to complete the tool.

6.6. Implementation and scope for further work

The validation exercise highlighted that in general, the framework in its current form was received well by stakeholders and would be valuable if implemented within projects. Additionally, six of the nine participants reported that the framework would be something they personally would use. This highlights the applicability of the tool within the context of school reconstruction in Nepal. While the number of participants was small, the exercise also enabled dissemination of the framework to stakeholders who completed it, providing them with a copy of the framework that they could keep and if desired, use within their future school reconstruction efforts. However, further work would be needed to identify and implement specific improvements within a final framework, along with a larger dissemination programme to build on the impact of this research.

Originally, as with the pilot study and phase two research, this phase of the study was going to be conducted within a third fieldwork visit to Nepal, due to have been conducted in May 2020. However, due to the ongoing global situation with the Covid-19 pandemic and the related travel restrictions, the risk of conducting this fieldwork would have been too high. While it was not possible to conduct this work within the timeframe of this study, the following steps should be considered as a means to conduct more in-depth validation, as well as providing a platform and basis from which to disseminate the decision-making framework, to increase its implementation.

This process is outlined in Figure 6-19, in which a series of focus groups and workshops are used to conduct a validation and dissemination exercise with multiple stakeholders present. One of the challenges identified within the research was that there was a lack of knowledge transfer and coordination between the different stakeholders involved, both within individual disciplines and roles, and between different disciplines and roles. This approach would bring together these stakeholders, providing a platform to encourage and enable this.

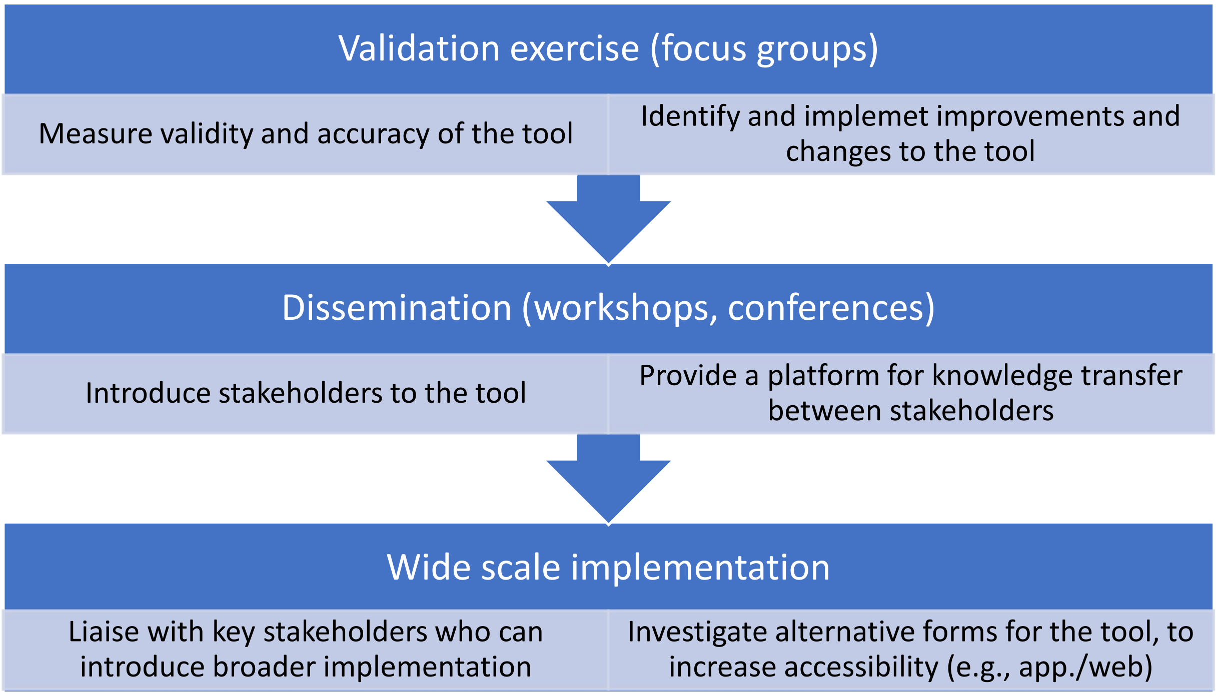

Figure 6-19 – Mechanism for in-depth validation, dissemination and implementation of the decision-making framework.

Initially, within a series of approximately five focus groups, with four to six participants in each, a validation exercise would be conducted. This would give a good sample size to collect a broad range of perspectives, while maintaining each session with a manageable number, allowing for effective discussion and contribution of all participants. These focus groups would have a similar approach to the online validation exercise conducted in this study, asking participants to work through the decision-making framework as if applying it with a project they have previously been involved in. However, the focus group format would allow for greater qualitative feedback, by enabling dialogue between both the researcher and other stakeholders. Through this, more detailed feedback could be gained, regarding particular issues and ways to improve the framework, as well as greater specificity of good practice tailored to the individual contexts. The collaborative approach to providing feedback and contributing to the framework would also work to help bring about a greater sense of ownership of it, which should lead to greater implementation.

Having adopted the necessary changes and improvements, the finalised decision-making framework could then be introduced to a broader audience. This would work well in two forms. Firstly, in tailored workshops, inviting school specific stakeholders (including schools identified for reconstruction, NGO staff, engineers and contractors, and members of the CLPIU-Education, NRA and other government bodies). These workshops would begin with a formal introduction to the framework, outlining the process through which it was created, and how it could be implemented within projects. Participants would then be given time to trial the framework for different scenarios, to demonstrate the range and flexibility that it can offer, and thus identify ways in which the framework would be applicable to their own role and work. There would also be space for participants to ask questions, as well as giving priority to discussion between stakeholders, as was done in the focus groups, to further the scope for knowledge transfer and dialogue. As well as workshops, the framework would be presented at national conferences in Nepal, as well as international conferences in the fields of disaster reduction, development, and earthquake engineering.

These workshops and conferences would increase the visibility of the framework, feeding into long-term implementation efforts. This would work at both a local level with stakeholders directly involved on the ground to improve bottom-up implementation within individual projects, and at a broader level with the potential to increase top-down implementation across multiple organisations and projects. To support this long-term implementation, it would also be beneficial to investigate other forms for the decision-making framework, to improve accessibility. This could include a web-based platform, or a mobile application, working as an interactive framework that could be used by any stakeholder involved in a school reconstruction project.

6.6.1. Application within other contexts

While the framework has been developed based on good practice within school reconstruction in Nepal, and this is therefore the optimum context for its use, there could be benefits to using it to recommend good practice in other construction contexts. While there is still school reconstruction work to be completed following the 2015 Gorkha earthquake, focus is shifting to school infrastructure in the rest of Nepal, which is still highly vulnerable. Work must be done to upgrade this vulnerable school infrastructure, through a process of either rebuilding or retrofitting structures. Some elements of the framework have a specific reconstruction focus, such as: post-earthquake/reconstruction specific funding sources;

broader post-earthquake pressures and challenges such as resource gaps; and differing materials and designs, if reconstructing versus retrofitting existing structures. However, much of the good practice recommended within the framework would be applicable and beneficial to the delivery of these upgrade programmes, such as; location and context specific challenges; mechanisms for training; monitoring construction and quality assurance; and managing project delivery, labour resources and logistics. It could also be beneficial to explore links with research into retrofitting approaches, and new technologies and construction techniques. These include those being researched within the SAFER project (e.g. a PVC 'sand-wich' (Tsiavos, et al., 2020) or a lead rubber bearing or friction pendulum isolation system (Cross, et al., 2019), which could be incorporated within a framework.

Another area of possible use for this framework would be in the reconstruction of other infrastructure, such as housing or community centres. Funding mechanisms differ for these infrastructures, projects are often owner-led, and a wider range of materials are permitted for construction including earth bags and mud mortar, which are not permitted for school construction. However, much of the good practice will still be applicable and relevant, particularly with regards to the logistical aspects of project delivery, sourcing materials and identifying suitable, safe sites.

This framework could also be of benefit if implemented in Nepal, or in other countries following a future earthquake event, where school infrastructure is also vulnerable and likely to suffer significant damage. It is important to note that, if used in other countries, extra consideration should be given, to ensure the good practice would be relevant or suitable. There may be different funding and implementation mechanisms in place, and the specific challenges and suitable materials may vary, particularly regarding accessibility, and topography. However, much of the general good practice for project delivery, safety and quality of construction would still be applicable, and it would remain a useful framework to map out each phase of a school reconstruction project and the necessary decisions that must be made. It would also be possible to use this framework as a template, altering the good practice to be more appropriate for another context.

6.7. Conclusion

Through the Phase One and Phase Two studies, a need for improving knowledge transfer of good practice between projects and organisations had been identified, in order to increase good practice implementation to improve the quality of Nepal's school reconstruction.

Therefore, from the results of this study, a prototype decision-making framework has been developed within Phase Three of the research. This draws together a wide range of good practice identified, thus helping stakeholders (e.g., SMCs, NGOs, engineers, and government officials) to identify suitable good practice for any given context.

A catalogue of reported good practice and the range of appropriate contexts was produced. From this, decision trees were produced, coupling the appropriate good practice with each decision that must be made within a project. These form the basis of the interactive framework developed, helping users navigate decisions in a coherent, structured, and comprehensible manner. Having produced the prototype framework, an online questionnaire was used to test its validity (considering the contextual accuracy, suitability of good practice, value, and functionality). This was completed by nine stakeholders involved in school reconstruction in Nepal, including an engineer, NGO representative, a government representative, and a project funder. The validation results indicate that the prototype framework has been generally successful, highlighting the general applicability of the framework for use in improving Nepal's school reconstruction approach. This included five of nine participants reporting that all or most good practice recommended was suitable for their context (and seven reports that all or most was implemented in the project). Eight of nine participants also reported that the framework would be helpful for them, or for less experienced stakeholders, which are likely to be groups that without the framework would have less access to other stakeholders, thus assisting with the knowledge transfer process. Key benefits of implementing this framework were identified as better project management, providing broader school or community benefits, improving construction quality, and reducing delays.

If implemented within ongoing or future school reconstruction projects in Nepal, this would improve Build Back Better efforts. While the framework was produced by identifying good practices within the earthquake-affected districts, many of the patterns identified, such as stakeholder roles, the factors affecting the suitability of materials, and practices linked to accessibility, or navigating government processes would also be applicable to school reconstruction efforts across the rest of Nepal, in the event of a future earthquake.

Chapter 7:

Conclusions

Chapter 7. Conclusions and further work

7.1. Key conclusions

Nepal is a highly seismically active country, with a history of experiencing significant earthquakes. The 2015 Gorkha earthquake caused widespread damage to infrastructure across 32 districts of Nepal, within the capital, Kathmandu, and particularly within rural areas. There was disproportionate damage caused to school buildings (with over 8000 schools being damaged or destroyed), highlighting vulnerabilities within Nepal's school infrastructure (Objective 1). These were due to poor construction quality (using unsuitable materials and a lack of seismic design features), and design requirements for schools (e.g., long unsupported spans, and large wall openings) (Objective 2). This is a trend that has also been seen globally, in other earthquake events and is deeply concerning given the vital roles schools play within communities, providing access to education, and during and after disaster events, acting as shelter for displaced families, centres for aid distribution, and assisting with children's recovery.

In Nepal, there has been a huge task to reconstruct the school infrastructure, and while good progress has been made, with approximately 80 percent of schools reconstructed, there have been delays and inefficiencies within the process and concerns over the quality of construction. There has been research into the challenges affecting housing reconstruction (He, et al., 2018; Bothara, et al., 2016; Sharma, et al., 2018), including a lack of coordination, knowledge gap, governance, accessibility, and socio-cultural issues. However, these works do not consider school reconstruction, and lack recommendations of specific actions that can be taken to reduce challenges. Research has also been conducted into the technical properties of new and existing construction methods and materials, and retrofitting options; however, there was a lack of understanding of the broader suitability and applicability of these, considering the broad range of project contexts, and the factors affecting construction in Nepal. Additionally, while initial investigations identified that there was good practice taking place within the school reconstruction process, there was a lack of knowledge transfer of these good practices between stakeholders, and the contexts in which these good practices would be suitable.

In response to these challenges, the aim of this PhD was to develop a framework to improve new and ongoing school rebuild efforts in Nepal, by transferring knowledge between stakeholders, and systematically mapping suitable good practices for specific contexts. This was achieved through a programme of fieldwork, to collect the perspectives of a range of stakeholders involved in Nepal's school reconstruction (Objective 4). Firstly, a pilot study was conducted to identify the key challenges affecting school reconstruction. This was done through interviews with five case-specific, and five high-level stakeholders involved with either an individual school or broader school reconstruction efforts. The phase two study sought to understand the relative impact of these challenges, identify good practice to overcome and mitigate them, and understand the contexts in which these are applicable; this data was collected within five case-specific, and four high-level face-to-face interviews, and one case-specific online questionnaire. Based on these findings, a prototype decision-making framework was produced (Objective 6). The third phase of this research used an online questionnaire, completed by nine participants, to validate the framework and measure its accuracy and efficacy.

The results of this study highlighted that while some good work is taking place, providing a range of appropriate solutions, these are not widely implemented, due to limited knowledge transfer, and projects are still facing multiple challenges, particularly in rural areas. Six key challenges were identified within the pilot study: 1) accessibility and transportation, 2) availability and suitability of materials, 3) skill and availability of labour, 4) government processes, 5) community involvement, and 6) suitability of land. Of these, accessibility and transportation present the most significant challenge (with a relative impact of 0.75 out of one), while community involvement had the least relative impact (0.25 out of one); however, each challenge can affect project budgets and increase costs, cause delays, affect quality and safety of construction, and limit the 'build back better' potential of projects (Objective 5). Some challenges were also perceived differently at different levels; for example, government processes formed 31 percent of the total challenge reports by high-level stakeholders, and only seven percent by case-specific stakeholders, while community involvement formed only 10 percent of high-level reports versus 21 percent of case-specific reports. This highlights the importance of effectively stakeholder engagement, as different groups bring awareness and appreciation of different aspects of project delivery and the associated challenges.

Three modes of project implementation were identified: 1) SMC led, 2) NGO led, and 3) contractor led (Objective 1). There are many stakeholders involved in the process, including schools and SMCs, NGOs, engineers, funders, and local and central government bodies, and their roles vary dependent on the mode and project context, making it a very complex process. As 75% of projects are delivered by SMCs (with limited, or no, experience in construction management), this limits the scope for knowledge transfer and awareness of the range of good practice that exists.

A range of materials used within Nepal's school reconstruction were identified, including fired bricks, reinforced concrete, compressed stabilised earth bricks (CSEB), and stone (Objective 3). However, there is no 'one-size-fits-all' approach, with suitability of materials affected by location, technical skill and knowledge, and access to materials. Understanding the context of a project is crucial to choosing the most appropriate material. There are also examples of earth bags being used, although this is not approved for school reconstruction by the government, indicating flaws within the approvals and checking process, raising broader concerns over quality assurance within construction.

A wide range of good practice has been identified to reduce challenges and improve project delivery; these are specific to different contexts and challenges. However, there was limited knowledge transfer between organisations, with examples of challenges identified without appropriate good practice to overcome these, despite suitable good practice having been identified by other participants. Therefore, the identified items of good practice (and the contexts in which they are applicable) has been collated, and a prototype decision-making framework has been produced, that systematically maps the school reconstruction process, and the key decisions that must be made and criteria that must be considered (Objective 6). Users can select the context of their project within the framework, and based on this, are provided with a range of recommended good practice that has been implemented in other projects, that would be suitable for that context. This framework improves knowledge transfer between organisations and stakeholders, sharing lessons learnt to improve ongoing delivery. This context-specific good practice is key for the applicability of the framework, acknowledging that there is such a diverse range of contexts of school reconstruction projects, and there is no 'one-size-fits-all' solution, with the need for tailored good practice based on the specific details of a project.

The validation exercise indicated that over half of the projects considered within the exercise had used most of the good practice recommended within the framework; this highlights that the good practice is appropriate and applicable while also showing scope for users to identify additional good practice that also could have been used. Confirming the applicability of the framework, within the validation exercise 89% of participants responded that the framework would be helpful, either for themselves, or less experienced stakeholders; this is very valuable considering the proportion of work overseen and managed by SMCs. Participants identified that the framework would benefit projects, helping to better manage construction, reduce delays, reduce costs, and provide additional benefits to both the school and community.

7.2. Further work

The validation of the framework was generally positive and indicated that the framework would be applicable and beneficial to school reconstruction projects in Nepal; however, there were two areas highlighted where improvements could be made. While 7/9 participants responded that most or some key aspects of project context were matched within the framework, more work could be done to improve how well the framework reflects the possible range of contexts. Additionally, 5/9 participants responded that the framework was too long. Unfortunately, due to only being able to complete validation remotely, there was limited suggestions of specific changes they would like to see. There is therefore scope to conduct more detailed validation of the framework, through a series of focus groups, as well as workshops, conferences, and stakeholder engagement to increase dissemination and implementation of the tool. Alternative forms of the framework (e.g., as a mobile- or web-based app), could also be investigated, improving its functionality and accessibility. Making use of social media should also be explored, to broaden dissemination and adoption of the framework; this could also help build links between people and practitioners in similar circumstances and contexts, developing a stronger community of school reconstruction stakeholders, to share additional experience and good practice. This would be particularly beneficial to further improve and encourage ongoing knowledge transfer between stakeholders.

The framework was produced based on school reconstruction in Nepal following the 2015 Gorkha earthquake. However, a framework of this format could also be beneficial in other construction contexts. Further work could be conducted to identify specific changes and developments that would be needed to broaden the applicability of the framework. These areas could include: reconstruction of other infrastructure in Nepal, such as housing, or medical facilities, which each have different implementation, coordination and funding mechanisms; retrofitting programmes, which will be particularly beneficial in other parts of Nepal, that were not affected by the 2015 Gorkha earthquake but where much of the infrastructure is still very vulnerable; and in other developing countries, where a similar framework could also be beneficial, although work would be needed to see how the contexts vary and how this affects what good practice would be suitable. It could also be beneficial to link with research into retrofitting approaches, and emerging technologies and construction techniques, (e.g., a PVC ‘sand-wich’ (Tsiavos, et al., 2020) or a lead rubber bearing or friction pendulum isolation system (Cross, et al., 2019)), to broaden the applicability of the framework.

Implementing this framework within school reconstruction programmes in Nepal, or exploring these additional benefits where a similar framework could be appropriate, would all work towards learning lessons from the 2015 Gorkha earthquake, improving the currently limited knowledge transfer between stakeholders, and meeting ‘Build Back Better’ targets, as specified within the Sendai Framework and the reconstruction framework for Nepal.

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Appendices

Appendix A:

Journal paper

Appendix A. Journal paper

The Road to Recovery: Understanding the challenges affecting school reconstruction in rural Nepal following the 2015 Gorkha Earthquake

Authors:

Louise Westoby[1], Sean Wilkinson[2], Sarah Dunn[3]

Abstract:

The Sendai Framework acknowledges the importance of having safe, resilient school infrastructure for continued access to education, and for their role in post-disaster recovery; however, in many countries this ideal is still only aspirational. This was evidenced in the 2015 Gorkha earthquake, highlighting major vulnerabilities within Nepal's school infrastructure, creating huge demand for school reconstruction in earthquake-affected areas, and school upgrade efforts in the rest of Nepal. This paper presents findings of a study into school reconstruction projects undertaken following the 2015 earthquake. The data presented was collected within two phases of fieldwork in Nepal, through 20 stakeholder interviews, both at a high-level, exploring broader involvement across multiple projects, and for individual case-specific schools.

This research identified six key challenges affecting school reconstruction; however, these differ in impact and are perceived differently by different stakeholders, affecting how they are considered within projects. Among the challenges, accessibility and transportation was reported as the greatest challenge representing a relative challenge of 0.75 on a scale of zero to one. Our research also highlights good practices, including providing training, or transporting materials outside of the monsoon season, that when implemented reduce timescales and budgets, and improve the quality of the reconstruction. We also found that there is little transfer of good practice between projects. Therefore, we argue that by highlighting better practice, our findings have the potential to help Build Back Better efforts in line with Sendai Framework targets, by improving the delivery of school reconstruction programmes in Nepal, or for other countries with similar contexts.

Key words

Build Back Better, Gorkha earthquake, Nepal school reconstruction, Stakeholder perspectives

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1. Introduction

Globally, major vulnerabilities in school infrastructure have been evidenced during previous earthquake events (Rodgers, 2012). One example is the 2010 Haiti earthquake, in which education was one of the most affected sectors, with 1,352 schools destroyed and a further 2,916 damaged (World Bank, 2010), leaving most communities with no immediate access to education facilities (Hill, et al., 2011) and some schools still closed after two and a half months (GOH, 2010). School vulnerability assessments have also highlighted the risks posed to schools, such as a study conducted in Tehran which found that less than 10% of schools could be classed as both structurally and geotechnically safe, and 597 out of 2125 schools could experience high levels of damage in a future earthquake event (Panahi, et al., 2014).

This is particularly concerning as schools play a vital role within communities and following earthquake events, serving as emergency shelters and a base for aid distribution efforts (Dixit, et al., 2014). It is also important for children to be able to return to school quickly following a disaster, as this can help children to overcome the trauma experienced, through returning to a normal routine and through activities and programmes run at the school (Cheal, 2010).

There are many factors influencing this high level of school damage, with construction lacking appropriate technology and enforcement of regulations (OECD, 2004). Following the 2009 Padang earthquake, assessment of damaged schools highlighted insufficient connection details and support to masonry walls, below what is specified in Indonesian building codes, possibly due to inadequate supervision during construction (Wilkinson, et al., 2012). A similar case was also witnessed in Haiti following the 2010 earthquake, in which there were discrepancies between the designs, in line with appropriate building standards, and the actual construction, with a lack of adequate seismic details included, possibly as a result of insufficient material quality control, and a lack of supervision to ensure that construction matched the design (Marshall, et al., 2011). The disproportionate school damage caused by the 2008 Sichuan earthquake was attributed to the lack of ductility and redundancy of structural members in the unreinforced masonry and non-ductile cast-in-place reinforced concrete frame construction typologies which were prevalent in school infrastructure (Miyamoto, et al., 2008). It has also been seen that despite high levels of damage, communities can be quick to rebuild in the same manner as before, re-introducing the same vulnerabilities. For example, a study in Indonesia highlighted a school being reconstructed using salvaged bricks from the previous structure, and extra very poor-quality bricks (Wilkinson, et al., 2012).

This paper explores the impact of the 2015 Gorkha earthquake, and subsequent school reconstruction within Nepal, which provides a particularly interesting case study, having implemented retrofitting programmes to improve seismic resistance of schools following the 1988 Nepal earthquake (Dixit, et al., 2014), and now, implementing school reconstruction programmes following the 2015 earthquake. This paper presents the stages of Nepal's school recovery efforts, from the provision of immediate to permanent facilities, before discussing six key challenges that affect the school reconstruction process in Nepal. These have been identified within two field visits to Nepal, in interviews conducted with a range of stakeholders involved at different levels, and supported by field observations and meetings with broader stakeholders involved in resilience and reconstruction efforts. This paper goes on to highlight examples of practices that have been implemented to overcome or mitigate these challenges. It is important to be able to understand the challenges, and the contexts in which they occur, as well as the appropriate good practice, when trying to plan for, and deliver, future reconstruction and retrofitting work.

1.1. Impact of the 2015 Gorkha earthquake

The M_w 7.8 Gorkha earthquake occurred on 25th April 2015 at 11:56 am NST (06:11:26 UTC), with the epicentre located in the Gorkha District, approximately 80 km northwest of Kathmandu (USGS, 2015b). This event was also followed by a series of aftershocks, most notably an M_w 7.3 event on 12 May 2015, to the east of Kathmandu (USGS, 2015a). This earthquake series caused widespread devastation across 31 of 75 districts of Nepal (increased to 32 after district restructuring): there were almost 9,000 fatalities and a further 22,000 injuries; approximately 500,000 houses were destroyed and an additional 250,000 suffering partial damage; along with damage to other sectors including education and medical infrastructure, and cultural and historical monuments such as temples (National Planning Commission - Nepal, 2015).

This followed on from a series of major earthquakes in recent years; over 66,000 buildings were damaged or destroyed in the 1988 earthquake (Bothara, et al., 2018), highlighting the vulnerability of Nepal's infrastructure, and the importance of seismic design. Work by De Luca, et al. (2019) and Gautam, et al. (2020) highlight the typical construction typologies of Nepal's school infrastructure, and the associated risks and weaknesses, indicating that over 90% of Nepal's school infrastructure can be rated as moderately to very highly vulnerable (Gautam, et al., 2020). Following the 1988 earthquake, efforts were made to improve resilience: the Nepal National Building Code was introduced in 1994 (Government of Nepal, 1994), and the Kathmandu Valley Earthquake Risk Management Project was started (Dixit, et al., 2000). Damage to 6000 schools (Dixit, et al., 2014) lead to the implementation of the School Earthquake Safety Programme (SESP) by the National Society for Earthquake Technology (NSET), within six districts, three in Kathmandu Valley, and three in more rural parts of Nepal (Dixit, et al., 2014). The SESP sought to evaluate risk to schools and then implement retrofitting programmes for the most vulnerable (NSET, 2000). An assessment of 700 public school buildings within Kathmandu Valley highlighted that only four to five percent were constructed with any seismic resistant design features, and only three buildings would have met the requirements outlined in the then draft Nepal National Building Code (Kandel, et al., 2004).

The first school to be retrofitted was completed in 1998, and progress continued at a rate of approximately 3 per year (Dixit, et al., 2015). In 2010, Nepal's Ministry of Education institutionalised the SESP, providing additional funding and support, and progress increased, with approximately 200 schools retrofitted from 2010 until the earthquake in 2015, totalling approximately 300 across the 17 years of the programme (Dixit, et al., 2015). While the achievements of the SESP are positive, initial earthquake risk management efforts in Nepal have highlighted a lack of capacity and technical experience, and a lack of appropriate local knowledge (Dixit, et al., 2013). Much of the literature around the SESP focusses on the achievements within Kathmandu Valley; while the number of schools is much higher within Kathmandu, it is important that rural schools are still covered in upgrade work, providing safe school infrastructure for all children across Nepal. Fitzmaurice (2015) highlights a range of school retrofitting efforts that have been conducted, and there is also evidence of other upgrade work conducted prior to the 2015 earthquake, including 11 schools retrofitted within Plan International's Safe Schools project (Bryneson, 2015), and 45 schools reconstructed or retrofitted in Taplejung by the Nepal Red Cross Society following the 2011 earthquake (Gautam, 2014).

Retrofitting efforts could be considered successful, with all 160 government retrofitted schools performing well in the earthquake (National Planning Commission - Nepal, 2015), and many being used for shelter for families whose homes were damaged (Dixit, et al., 2015). It is important to note that the majority of these schools were located within Kathmandu Valley, where, due to ground composition of soft-surface deposits, the ground shaking experienced was lower than estimated peak ground accelerations calculated within recent seismic hazard analysis (Goda, et al., 2015). Paci-Green & Pandey (2016) also highlight retrofitted schools outside of Kathmandu Valley, for instance in Rasuwa and Sindhupalchowk districts, which also performed well, when non-retrofitted buildings on the same site and in the vicinity suffered damage; however, they also identify retrofitted schools that collapsed, for example in Rasuwa, due to poor-quality construction, lack of community engagement, and lack of technical oversight. Additionally, the scale of retrofitting implementation was small, relative to the size of the challenge and this was highlighted during the 2015 Gorkha earthquake, in which 8,242 public schools were destroyed or suffered damage (National Planning Commission - Nepal, 2015). The earthquake occurred on a Saturday, while schools were closed, so no lives were lost in damaged school infrastructure (Molden, et al., 2016). If an earthquake of a similar magnitude were to occur during school hours, there would have been a large loss of life.

Nepal is now in a period of reconstruction, an enormous task presenting many challenges. There has been research into challenges affecting this reconstruction, identifying a lack of coordination, governance and reconstruction infrastructure, accessibility, manpower shortage, knowledge gap, and socio-cultural issues, among others (Sharma, et al., 2018; Bothara, et al., 2016). He, et al. (2018) echo some of these findings, also highlighting that existing vulnerabilities and disadvantages can add pressure which can lead to hasty and therefore ineffective reconstruction. However, these works all focus on housing reconstruction, with little or no inclusion of the education sector. This paper outlines research into specific challenges affecting school reconstruction, as while there is some similarity in the challenges, these differ, particularly in how they impact upon projects, and the mechanisms through which reconstruction is coordinated and funded.

It is important to understand the specific impacts of these challenges, in order to identify effective good practice that can be implemented to overcome and mitigate the challenges. By doing this, it will work to improve the safety and seismic resilience of Nepal's school infrastructure in line with Build Back Better (BBB) principles, particularly the aim that "Good recovery must leave communities safer by reducing risks and building resilience" (Clinton, 2006). The Sendai Framework (UNISDR, 2015) outlines BBB as a target for recovery, and it has been emphasised in Nepal's Post-Disaster Recovery Framework (National Reconstruction Authority, 2016), something that was not implemented following the 1988 earthquake (Bothara, et al., 2018). While BBB is an important part of Nepal's recovery efforts, it is important to acknowledge the ambiguity of 'better', which may refer to improved aesthetics or functionality, rather than reducing risk; Kennedy, et al. (2008) instead propose the use of

'Build Back Safer', while Platt, et al. (2020) highlight that BBB should also include a 'Build Back Safer' approach. Nepal should therefore utilise the opportunity that reconstruction presents, to not only ensure that school infrastructure is constructed with adequate resistance and resilience for all potential hazards, but where feasible, and not to the detriment of safety, to also improve the functionality and broader impact of school reconstruction and optimise the use of resources.

However, this is not straightforward; there has been a failure to implement effective 'build back safer' approaches in Nepal (Platt, et al., 2020), as well as examples elsewhere, such as those following the 2009 L'Aquila earthquake (Imperiale & Vanclay, 2020). Additionally, while the existing literature on reconstruction in Nepal identifies some overarching areas in which improvements are necessary to see positive change, they do not address specific mechanisms through which these can be achieved, particularly across the diverse range of contexts present in Nepal. We now present the methodology and results of two field investigations, identifying actions that can be taken to improve individual school reconstruction and nationally work towards building back better and safer in ongoing and future reconstruction efforts.

2. School reconstruction process after Gorkha earthquake

2.1. Phases of school recovery

Nepal has previously struggled with low education and literacy rates, but in recent years had made major progress improving this situation, increasing primary level enrolment from 64 to 96 percent since 1990 (USAID, 2019). Therefore, it was important to ensure minimal disruption to schooling, in order to maintain access to education for students, and reduce the number of students dropping out of school during the long process of recovery for schools following the 2015 Gorkha earthquake. This recovery comes through several phases, to provide temporary learning facilities in the short term, allowing immediate access to education, and permanent reconstruction in the long term, to provide suitable, safe educational facilities.

Immediately following the earthquake, schools which had been damaged received Child Friendly Spaces (CFSs). These are designed to be delivered rapidly after a disaster, to provide safe spaces for children to meet, play and process the trauma, as well as providing childcare, allowing families to begin to re-establish homes and livelihoods (Snider & Ager, 2018). Over the following months, CFSs were replaced by Temporary Learning Centres (TLCs), constructed using locally available materials such as bamboo, wood, corrugated galvanised iron (CGI) or tarpaulin (GPE Secretariat, 2015), and in some cases, may be built on the existing foundations of the destroyed building, as shown in Figure 1. Following the earthquake, 3576 TLCs have been constructed, providing facilities for most children to continue to access education (Fievet, et al., 2016). However, TLCs generally only have an intended life span of approximately 6 months and are not an adequate long-term learning environment (Niroula, 2019). This is particularly the case for a country like Nepal as TLCs provide little weather-proofing to cope with the extremes in weather and climate faced, including monsoon rains, very hot summers in the terai region, and very cold winters in mountainous areas (Discover Nepal, n.d.)

Figure 1 - A Temporary Learning Centre in Sindhupalchowk, constructed using timber and corrugated sheets, built on the existing foundations of the damaged school, visited during fieldwork conducted in Nepal.

As well as providing temporary learning facilities, the Structural Integrity and Damage Assessment (SIDA) was conducted by the World Bank, to assess the earthquake damage caused to public schools (Adhikari, et al., 2016). This identified the construction typology, the level of damage caused, and details about the size and location of the school and was used to help prioritise permanent reconstruction efforts. As Figure 2 shows, even several years after the earthquake, many schools still had not received permanent structures. In 2016, UNICEF began work to construct 650 Transitional Learning Centres at those schools that had not yet been assigned for permanent reconstruction, as schools were still relying on TLCs which were inadequate for this long-term use (UNICEF Nepal, 2018). These transitional structures are constructed using a steel frame, bamboo walls with a cement plaster and a steel roof, and have a design life of five years, and provide a more suitable learning environment (Niroula, 2019).

As of November 2020, 6,058 school buildings had been reconstructed (80 percent), with an additional 1468 (19 percent) under construction, all in line with BBB principals (National Reconstruction Authority, 2020c). However, there are still many reports of schools not yet constructed, or facilities provided not meeting the needs of the schools (Karki, 2020). There are also reports that in some areas, reconstruction has not been possible due to challenges such as lack of land, and in areas that are not accessible by road (National Reconstruction Authority, 2020b). This highlights that while much progress has been made, there is still much work to be done, to fully reconstruct the affected schools, and there are flaws in the current process and delivery of these reconstruction projects. However, it should be noted that the progress of school reconstruction is more advanced than in other sectors, with 70% of houses, 59% of health facilities, and 50% of heritage sites fully reconstructed (National Reconstruction Authority, 2020c). Schools can therefore offer lessons in how to approach reconstruction activities.

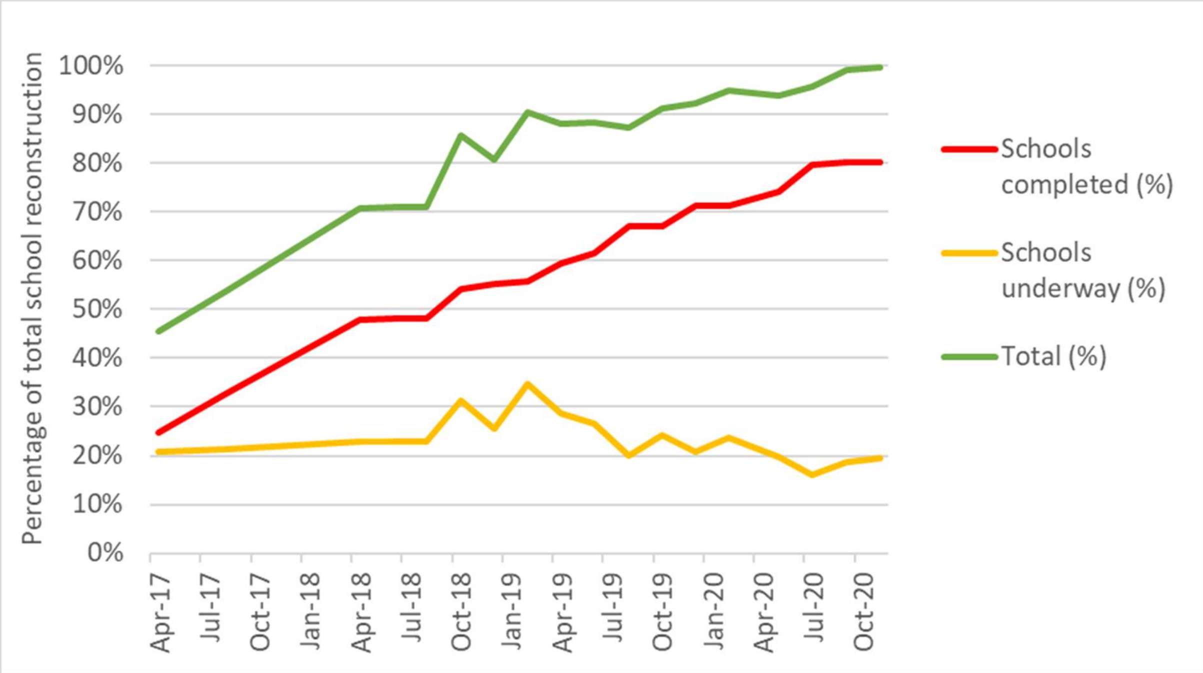

Figure 2 - Progress of school reconstruction in Nepal following the 2015 Gorkha earthquake, from April 2017 to February 2020, shown as schools completed, schools underway, and the total (out of the 7,553 target schools to be reconstructed) Source: (National Reconstruction Authority, 2021)

2.2. School reconstruction coordination

Reconstruction in Nepal is coordinated by the National Reconstruction Authority (NRA), established in December 2015 (National Reconstruction Authority, 2016). The Central Level Project Implementation Unit (Education) (CLPIU-Education) sits under the NRA, taking responsibility for the delivery of all school reconstruction efforts (CLPIU-Education, 2016). The CLPIU-Education is supported by District Level Project Implementation Units (DLPIUs), which have been created for the 20 most affected districts, in order to provide more localised support and coordination (CLPIU-Education, 2016).

There are three major stakeholder groups directly involved in delivering school reconstruction: 1) through a community managed approach coordinated by School Management Committees (SMCs); 2) though a tendering process with professional contractors; and 3) through I/NGOs who may adopt either implementation mechanism (Carter, 2020). While there is some variation in reports of the distribution of these modes (one interview participant in this study, also echoed by Carter (2020), reported a 75%, 10%, 15% split respectively), latest figures published by CLPIU-Education (2020) (at the time of writing) suggest this is closer to 82%, nine percent and eight percent for SMC, contractor and I/NGO respectively. While this has the benefit of providing a locally appropriate response, with the majority of construction overseen by SMCs, they also have very limited, or no, experience of managing construction projects, and this limits the potential for knowledge transfer between organisations, when individual schools are responsible for overseeing their own construction. This reduces the ability to share good practice between stakeholders and therefore broaden its implementation. Additionally, these three stakeholders must work in conjunction with many other stakeholders, who each have a role to play in delivering school reconstruction projects, including the schools and communities, engineers, architects, masons and labourers, volunteers, lawyers, CLPIU-Education and local DLPIU offices. This creates a very complex network of involvement, and requires the consideration of many different perspectives within the process, in order to work most effectively.

This makes the process of reconstructing schools in Nepal very complicated, and there are many challenges affecting this process, which will be explored further in this paper. The process of identifying the key challenges will be outlined, before providing an analysis of the relative impact of the different challenges, specific challenge narratives, and how perspectives differ between stakeholders. Flaws and gaps within the current delivery of reconstruction projects will be highlighted, as well as indicating elements of good practice that have been implemented to overcome and mitigate these challenges. This good practice can be used to inform and adapt ongoing and future school reconstruction and upgrade efforts, leading to better cost and time-management of projects, improved quality and seismic resistance of construction, and increasing the wider benefits of construction, in line with the BBB approach.

3. Methodology

3.1. Approach

To identify and understand the challenges affecting school reconstruction and identify examples of good practice that have been implemented, 20 interviews were conducted, with different stakeholder groups, across two visits to Nepal. This is a similar approach to that implemented by Sharma, et al. (2018) and He, et al. (2018), in their research into challenges affecting housing reconstruction in Nepal, although this study is smaller in scale. There are a range of considerations when planning the size of a study, including constraints of time and resources, the practical challenges of conducting interviews in the given context, and the familiarity of participants with the research focus (Baker & Edwards, 2012; Bonde, 2013). Due to these factors, the number of participants is small, however, this still falls within literature recommendations including: between 12 and 60, by Adler & Adler (2012); between one and 260, by Brannen (2012); and between 15 and 60, by Saunders & Townsend (2016).

Alongside these interviews, other ‘complementary work’ was conducted while in the field (Arksey & Knight, 1999). These activities included field observations, i.e. visits to case specific schools, and earthquake-affected communities, exploring past and ongoing resilience efforts both in Kathmandu and in rural communities. Interviews and meetings were also conducted with other experts relating to the field, i.e. professors of structural engineering, and stakeholders involved with other reconstruction work or damage assessments. The results of this complementary work are outside the scope of this paper, but provided broader perspectives and understanding, outside the core focus of the study of school reconstruction (McCulloch, et al., 2000). This work is beneficial when exploring wider generalisations that can be made, and the applicability of findings to other sectors.

The first visit took the form of a pilot study whose aim was to provide a better understanding of the current situation in Nepal, to explore the overall impacts of the earthquake, and the previous and ongoing retrofitting and reconstruction work. This visit also helped to narrow the scope of the study, identifying common challenges to be explored in the second visit. The aim of the second visit was to understand the challenges identified in more detail and how they impact on each other, understanding the contexts in which they occurred, and identifying good practice that has been used to overcome these challenges and why they were successful.

The interviews conducted in both visits took the form of one-to-one interviews with stakeholders, conducted in person, and through an interpreter where necessary, if participants' English comprehension was limited. One-to-one interviews were selected, rather than bigger group conversations, as this provided a safer space for participants to share views more freely, particularly those that may have negatively reflected projects (Gill, et al., 2008). It was also important to allow for more natural conversation between interviewer and interviewee, while covering the key areas of interest, without trying to balance multiple views, had more than one participant been present. Working with an interpreter can create a divide between interviewer and interviewee, so in order to minimise this, practices were adopted to best follow a normal conversation flow: outlining the purpose and content of the interview to the interpreter in advance; allowing the interpreter to directly ask follow-up questions to the interviewee in order to clarify details, to improve the natural interview flow; and encouraging the interpreter to speak in the third person, to clearly denote their separate role within the interview (Edwards, 1998).

In both visits, there were two different interview schemes: case specific, following individual schools undergoing reconstruction work; and high-level, looking at broader involvement with school reconstruction programmes. These two levels were selected as they provide a dual scale view of the stakeholder perspectives involved; case specific projects provide a micro-scale view in which it is easier to identify specific challenges affecting a project, and particular practices implemented to improve project delivery, while high-level interviews provide a 'top-down' view of projects, giving insight into the wider coordination, funding, regulation and implementation efforts, as well as a better understanding of the more general applicability of different construction methods, materials, and more generally accepted good practice within project delivery. Both of these perspectives provide valuable insight into the school reconstruction process. By examining and comparing both, discrepancies between experiences and perspectives at the two levels can be identified, suggesting areas in which there may be miscommunication between different project stakeholders, or aspects of projects that are underappreciated at either the case-specific or high-level scale.

3.2. Phase one – pilot study

The phase one visit was conducted during October to November 2017. The majority of the visit was spent in Kathmandu, meeting with a range of organisations involved in broader resilience work in Nepal, visiting urban case specific schools and conducting interviews with stakeholders involved in the reconstruction process. The visit also included shorter trips to more remote areas of Nepal, exploring resilience work on the ground, observing a broader range of earthquake damage, particularly the impact of landslides, and visiting rural case specific schools.

The main form of data collection within this visit was through semi-structured interviews with stakeholders involved in the school reconstruction process. This format was chosen as it gave the interviews structure, following a standard set of questions for all participants, but also gives the freedom for the participant to expand on answers and direct the flow of the interview to other relevant areas of interest (Berg, 2001). This was beneficial in this preliminary phase of research, to cover all the key facets of reconstruction but giving space to understand more of the individual perspectives and experiences of the individual stakeholders, especially in areas that had not initially been considered or covered in the interview schedule, to gain a fuller understanding of the school reconstruction process.

Five interviews were conducted with stakeholders representing individual case specific schools, with visits to three of these schools. The details of these schools are provided in Table 1, and locations are shown in Figure 6; the schools provide a range of contexts including differing levels of remoteness and accessibility, size and construction materials. Five high-level interviews were also conducted with stakeholders regarding the broader school reconstruction process, including an architect, a lawyer, an engineer, a communications manager overseeing project implementation and liaison between partners, and a project coordinator overseeing project selection and implementation.

Table 1 - Overview of the five pilot study case specific schools

Case Study	Location	District	No. of pupils	Material	Participant role
1	Urban, ~1 hr from centre	Kathmandu	~500	Reinforced concrete and fired brick	School representative
2	Urban, central Kathmandu Valley	Lalitpur	~1100	Reinforced concrete and fired brick	School representative
3	Rural, ~9 hrs from Kathmandu	Gorkha	~25	Compressed stabilised earth bricks	Engineer/ project lead
4	Rural, ~3.5 hrs from Kathmandu	Sindhupalchowk	~60	Compressed stabilised earth bricks	Engineer
5	Rural, ~12 hrs from Kathmandu	Ramechhapp	~100	Earth bags	NGO representative/ project lead

The interview schedules covered three main areas of the reconstruction process: the impacts of the earthquake, including the damage caused to infrastructure and facilities, and disruption to teaching; the reconstruction itself, covering the materials and design used, and the timescales for construction; and the project coordination and implementation, including project roles and identification of schools for reconstruction. Within each of these areas, there were opportunities to highlight challenges faced, as well as providing information to build up a better picture of how the school reconstruction process works for different schools in Nepal.

A broad range of challenges were identified across all the interviews, in the form of individual narratives reported by participants. As the number of interviews was relatively small, the interview data was analysed by applying a process of manual coding (Basit, 2003), allowing the researcher to be directly involved in categorising the data, rather than utilising electronic coding software. In this, the interview transcripts were subdivided into stanzas, each relating to an individual report of a challenge or something that negatively impacted upon school reconstruction; each stanza was then manually assigned a code, summarising the specific challenge represented (Saldaña, 2013; Dey, 1993). These codes were informed and selected based on several criteria, including preliminary judgements made while conducting and transcribing interviews, observations made in the field, and findings of other studies. Having coded the transcripts, the codes were categorised, grouping together similar challenges into the major themes, before applying simple statistical analysis to analyse the data further. This was initially done separately for the case-specific and high-level participants. The results of these are presented in Figure 3 and Figure 4 respectively. It is useful to see how the categories differ between the two groups, identifying the key perceptions for stakeholders involved at each level.

While the classifications differ, there are also similarities between some of the challenges reported. To compare the results more directly, all transcripts were then analysed together, categorising the codes based on a set of common challenges across both case-specific and high-level participants, shown in Figure 5 with further detail provided by Westoby, et al. (2019). Six challenge categories were identified: 1) accessibility and transportation, 2) the quality and availability of materials, 3) the skill and availability of labour, 4) the government process, 5) the suitability and availability of land, and 6) community involvement. This is in line with recommendations by Lichtman (2010) and Creswell & Poth (2016), suggesting that data should be condensed into five to seven key themes.

As Figure 5 shows, there are discrepancies between the frequency of challenge reports by high-level and case specific interview participants; for example, only high-level participants reported challenges relating to the government process, whereas most reports of challenges relating to accessibility and transportation, community involvement and land availability were from case-specific participants. While, in part, these may be explained by the particular experiences of the interview participants, it was important to investigate these differences further, and to understand the relative impact of the challenges in more detail.

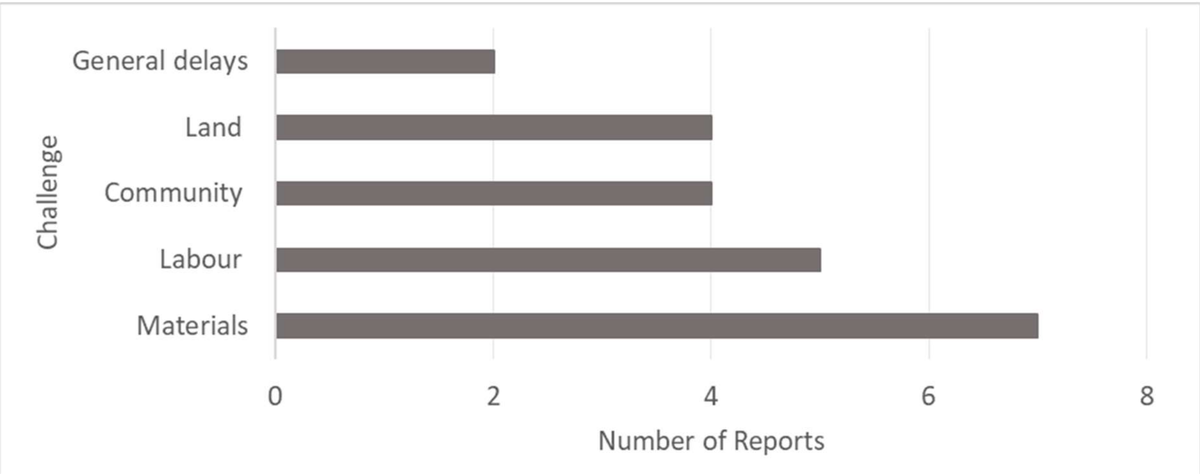

Figure 3 - Reported challenges for case-specific schools. These have been grouped into five main categories, may reflect multiple reports of challenges in the same category, from an individual case-specific school. (Westoby, et al., 2019).

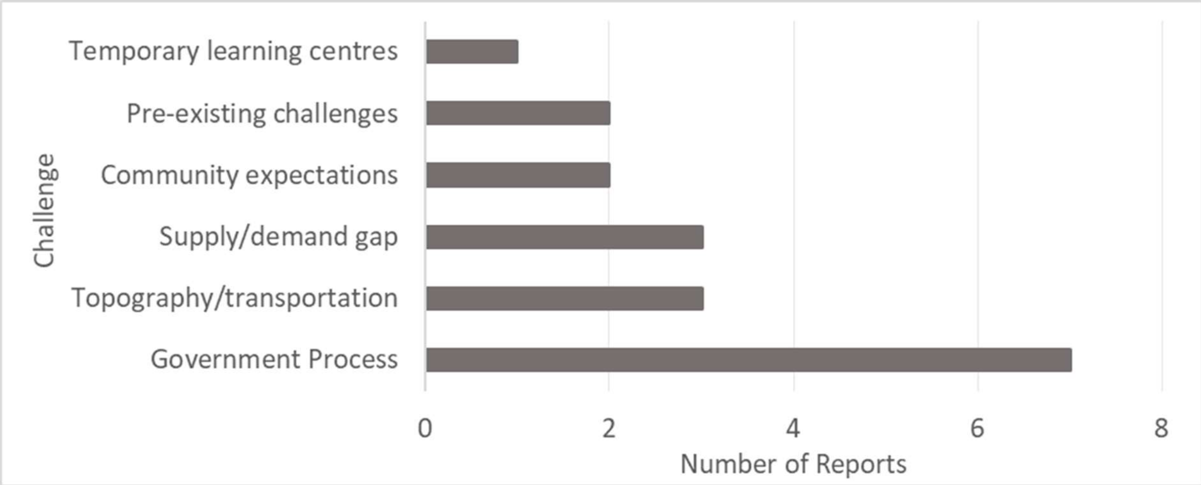

Figure 4 - Challenges affecting school reconstruction in Nepal, reported within high-level interviews. The data shown represents the number of reports of challenges within a category, rather than the number of participants reporting that challenge. (Westoby, et al., 2019)

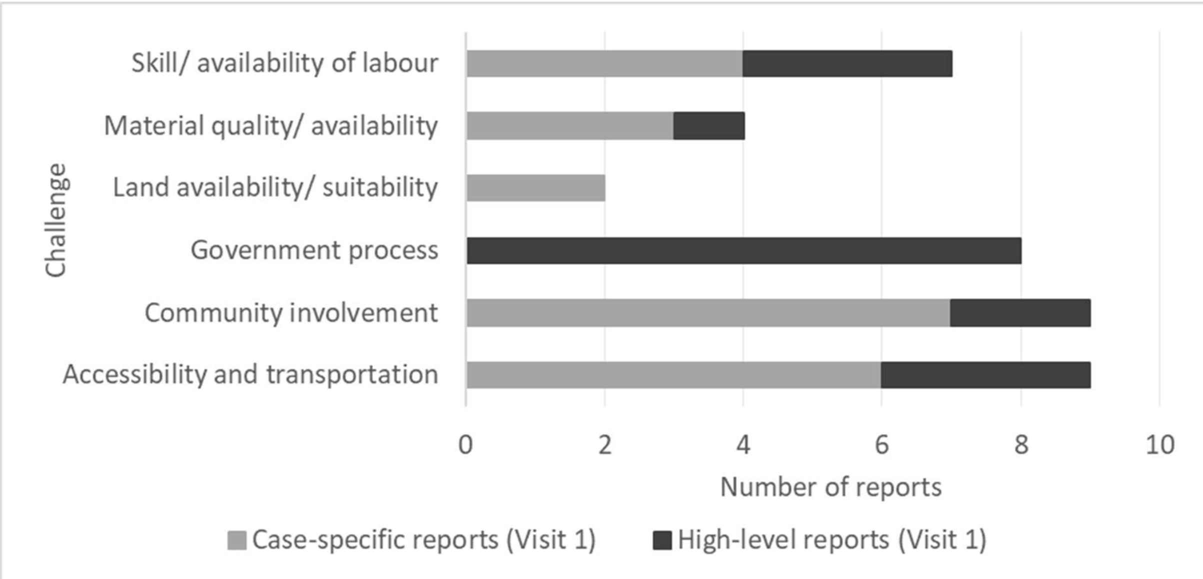

Figure 5 - The number of reports of challenges within each challenge category, as reported within the pilot study interviews, by high-level and case specific participants. NB: this represents the number of individual reports of challenges within a category, rather than the number of participants reporting challenges relating to a category, to highlight the range of challenges each category represents.

As shown in Table 1, there were variations in the construction materials used to reconstruct schools. Within the case-specific schools, reinforced concrete and fired bricks were used for the two urban schools, while the rural schools used either compressed stabilised earth bricks (CSEB), or earth bags. High-level participants highlighted that reinforced concrete and fired bricks were also used in some rural contexts, and stones were another common construction material, particularly for very remote schools. Gautam (2020) also highlights the use of timber within construction, and De Luca, et al. (2019) identify the use of steel frame construction for schools, as well as highlighting how the proportions of different construction typologies will vary over time, particularly in the earthquake affected areas, as particular typologies are more frequently adopted for reconstruction. There are several factors affecting the suitability and desirability of different materials in each setting: one participant reported: *"If it is three to four hours up a dirt road, and they can't afford the fired brick ones, they are like '[CSEB] is just amazing, we can rebuild the house at half the cost, and it looks just like brick and it's really* *strong'."*, while another stated: *"If we go a bit higher up, stone is very cheap and easily available, so people there would rather build with stone, so feasibility is a deciding factor as well."* It is also important to note that, despite being used in a case-specific school, and in other school reconstruction projects, earth bags typically are not approved by the government for school reconstruction, due to concerns over reliability and safety. This raises concerns over the adequacy and diligence within the approvals and checking processes, which may lead to a sub-standard quality of construction.

The findings of the phase one visit provided a good initial overview of the school reconstruction process in Nepal, identifying different stakeholders involved and a variety of delivery mechanisms for projects, as well as highlighting common challenges that affected project delivery. However, the findings also highlighted areas in which further investigation was required, which were explored within phase two of this research. Having grouped these areas for further investigation into six common challenge categories, it was important to understand the specific ways in which they affect projects, and how they are perceived by different stakeholders, as well as identifying good practices that can be used to mitigate or overcome these challenges, that could be applied within ongoing and future work.

3.3. Phase two – understanding challenges and good practice

In order to develop the findings of the pilot study, a second visit to Nepal was conducted in October to November 2018. The aim of this phase was to interview more case specific and high-level stakeholders, to understand the impact of the three project delivery and implementation mechanisms, understand the challenges identified in more detail, and identify practices used to overcome or mitigate these challenges, and work to utilise reconstruction as an opportunity to BBB.

There were six case specific interviews, detailed in Table 2 and shown in Figure 6, and four high-level interviews, three of which were with representatives of different NGOs with a range of backgrounds and project styles, and one representative from CLPIU-Education. Due to the practical constraints of conducting fieldwork, the case-specific schools only present limited construction materials, and do not cover other materials such as stone. This is due to the practical constraints of conducting fieldwork and is indicative of the remote locations in which these materials are often used. However, this is addressed within the high-level interviews, which do provide acknowledgement of the broader range of construction materials used.

Most of the phase two interviews also followed a semi-structured approach. However, while in the pilot study this was used to highlight other areas of interest not previously considered, within the phase two interviews, this gave the interviewer the freedom to ask follow-up questions, outside of the main interview schedule, to investigate aspects in more detail and gain deeper insight into participants' individual experience and perspectives (Berg, 2001). As well as the face-to-face interviews, an online questionnaire was produced to replicate the interview schedule, to reach participants it was not possible to meet with in person, which was important due to the geographical and time constraints of the field study (Van Selm & Jankowski, 2006). While this does not allow as much scope for participants to expand on answers, the balance of succinct qualitative and quantitative questions still provided a valuable response. One case-specific participant responded via the online questionnaire.

Within the phase two visit, participants were asked specifically about the six challenges identified within the first visit, in order to better understand the impact these challenges have upon projects. They were asked to rate these as either 'no challenge', a 'minor challenge', or a 'major challenge', in order to understand the relative impact of each of these challenges. These discrete ratings were selected, as opposed to a numerical scale, e.g. one to five, as they give a clearer definition of each level, increasing the reliability of responses between all participants (Alwin & Krosnick, 1991). Within the analysis, to quantify the relative impact of each of the challenges, participants' responses of challenges as 'no challenge', a 'minor challenge', or a 'major challenge' were assigned values of zero, 0.5 and one respectively, in order to identify mean and modal scores for each challenge, to compare and rank them. Participants were also asked to give details on how the challenges affect projects, such as effects on cost, time, and quality of construction.

Alongside this, as with the pilot study data, the phase two data was analysed using manual coding to categorise the individual narratives into the six common challenge classifications (Dey, 1993). For each participant's responses, a process of cross-referencing was then used to link challenges identified with the associated good practices reported that had been implemented to overcome or mitigate them, and the relevant contexts in which they had been applied. It is important to note that all of this good practice has been identified as having actually been implemented within school reconstruction projects within Nepal, demonstrating the suitability for this context, and learning lessons from those actively involved on the ground in delivering these projects.

Table 2 - Overview of the six phase two case specific schools

Case Study	Location	District	No. of pupils	Material	Participant role
1	Urban, ~1hr from centre	Kathmandu	~600	Reinforced concrete and fired brick	Head teacher
2	Rural, ~4 hrs from Kathmandu	Sindhupalchowk	~110	Reinforced concrete and fired brick	Head teacher
3	Rural, ~3.5 hrs from Kathmandu	Sindhupalchowk	~800	Reinforced concrete and fired brick	Assistant head teacher
4	Rural, ~6.5 hrs from Kathmandu	Dolakha	~60	Reinforced concrete and fired brick	School Management Committee member
5	Rural, ~4 hrs from Kathmandu	Dhading	~80	Reinforced concrete and fired brick	Project Manager
6 (Online)	Rural, ~8 hrs from Kathmandu	Ramechhapp	~90	Reinforced concrete and stone	Construction Manager

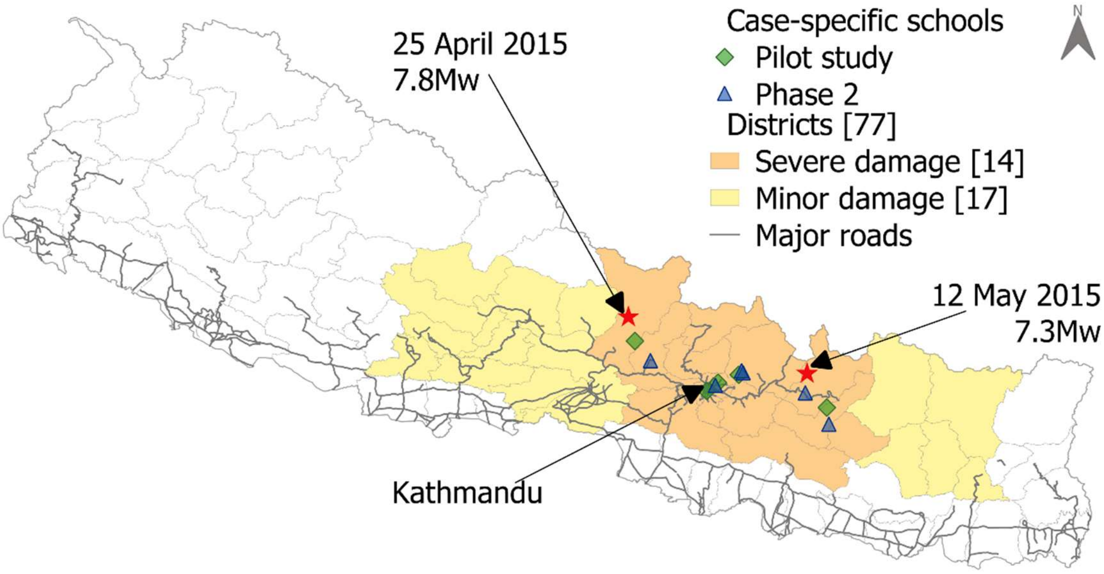

Figure 6 - Map showing the locations of case-specific schools within both the pilot and phase two studies, with reference the location of Nepal's capital, Kathmandu, to the level of earthquake damage in each district, and the epicentres of the April 25 and May 12 earthquakes.

4. Findings

The interviews conducted across the two fieldwork visits provided insight into the three delivery mechanisms (SMC, contractor, and I/NGO) discussed in Section 0. With the majority of projects being delivered by SMCs, there is by definition already some involvement of the local community who have good knowledge of the needs of the school and local area (which is important for siting of the school and understanding transport issues etc); however, it presents challenges in that SMCs generally lack the experience or skills to manage construction projects (as one high-level participant highlighted the need to train SMCs in project management aspects), and limits the ability for a joined-up approach between multiple schools and organisations. On the other hand, the projects led by the contractors and other experienced organisations will have good experience of delivering schools – one high-level participant reported that their experience meant they were able to mitigate against potential challenges (*"community involvement is not a problem for us … Because we are working with the community since long time … We know how to work with them"),* while another reported: *"after the earthquake we have … reviewed our school construction activities that were done prior to the earthquake … [and therefore] we updated our design".*

However, there is the potential for issues arising, if providing a 'one size fits all' style solution, using one of a range of standard designs by the CLPIU-education. These may overlook the specific requirements of the individual schools, and may not be suitable for the project context, or level of earthquake hazard in the region, although further work, beyond the scope of this study, would be required to evaluate the safety and applicability of these designs for use across Nepal. In the case of projects delivered by NGOs and INGOs, the interviews revealed that these organizations tend to develop a pattern of school delivery (e.g. they may only deliver one specific building technology (e.g. CSEB) or one location (e.g. urban Kathmandu). This has the benefit of growing expertise and empathy for these specific contexts and communities; however, has the potential for a mismatch between the type of project they deliver and the requirements of the receiving community. For example, challenges of transporting chosen construction materials to site were identified*: one high-level participant reported: "Because of damage of road … bricks [are] broken ... sand … spills somewhere … that's a loss*", while another reported: *"carrying fired bricks on someone's back, for two days, it's not feasible, it's not feasible all over Nepal",* adding *"it's a major challenge to get good materials on the site so you can start building. Fired bricks are breaking on the way, cement has not been stored properly"*. This would suggest that using a different construction material, making use of more local resources, may have been a more suitable solution in individual contexts. Other case-specific schools reported that the limitations of the project meant that the new facilities did not meet all of their needs: one reported that it was not possible to include a hostel within the design, despite the school providing residential care for pupils, while another reported that to improve the construction they *"would make a two storey building, as the classes are not enough for the children."*

One of the primary focusses of the interviews was to identify and understand the range of challenges faced when reconstructing schools in Nepal. This covered the specific and relative impact of each of the six challenges identified within the pilot study, exploring how views differed between stakeholders and at case specific versus high-level perspectives.

4.1. Challenges and good practice

Having identified an imbalance in levels of reporting of different challenges between case specific and high-level participants in the pilot study, this was investigated further in phase 2.

As Figure 7 shows, accessibility and transportation was the most commonly reported challenge with 18 individual reports across the 20 interviews conducted in the two phases, while challenges relating to materials and land were least frequently reported, with ten and nine reports respectively. While it is useful to see the total reporting values for the two visits, Figure 7 shows a discrepancy in the reporting of some challenges between phase one and phase two results, such as land availability, with only two reports in the first visit, but seven in the second, and community involvement, with nine and four in the first and second visits, respectively.

It was seen within the pilot study that rural projects experienced more challenges than those in urban areas. Therefore, the phase two interviews had a greater focus on rural projects, with a higher proportion of participants having experience of rural school construction, particularly for case-specific schools, in which five out of the six were in rural locations or within a town a long way from Kathmandu, facing many of the same challenges of accessibility and access to resources as a rural school. This is reflected in the reported impact values; for the one case-specific school in Kathmandu, only two of the six categories were reported as causing a challenge for the project, and these were only minor, while the other schools experienced more of the six challenges, and at a greater impact. This will have influenced the shift towards greater numbers of reports of some challenges, particularly for land and materials which are very dependent on location, with limited suitable land to construct on, and reduced access to quality materials. While this does cause a shift in results for the second visit, with generally higher numbers of reports for challenges, as shown in Figure 7, this is better representative of challenges across all earthquake-affected districts, most of which are considered rural.

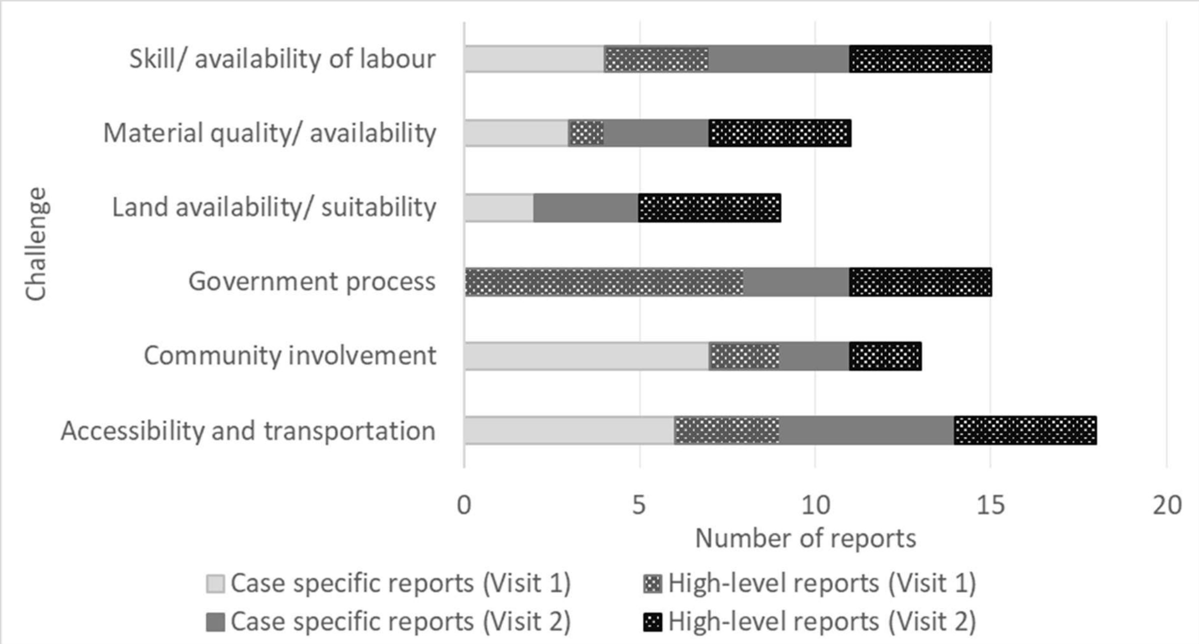

Figure 7 - Challenges affecting school reconstruction in Nepal, reported within pilot study and phase two interviews.

While it is useful to see the most commonly reported challenges, or those that may occur most frequently, this does not necessarily represent the impact each challenge may have on a project, and how these challenges are acknowledged. Figure 8 shows the levels of reporting by both case-specific and high-level participants, as proportions of the total reports for each group, as well as indicating the mean impact rating given to each challenge. This highlights that there are several areas, such as community involvement and the government process, that are perceived differently at different levels, both with respect to the occurrence and prevalence of each challenge and the impact they have on projects. The perceptions of relative impact of each challenge are demonstrated in Figure 9 which shows the mean impact of each challenge, as assigned by both case-specific and high-level participants, as well as showing the mean impact rating from all responses within the phase two study. It is important to note that all impact values assigned by case specific participants were generally lower than those of high-level participants, with fewer challenges identified as major challenges.

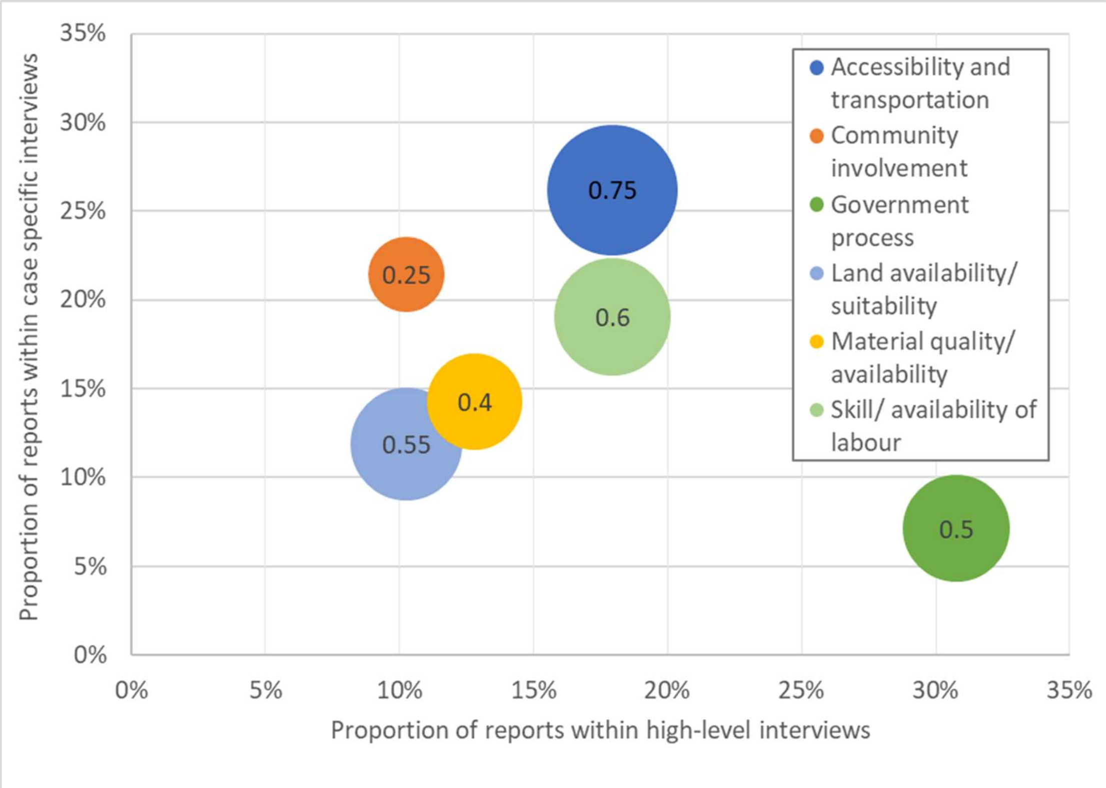

Figure 8 - Challenges reported, as proportions of total reports, within the Visit 1 and 2 interviews, by participants in the high-level interviews, vs. participants in case specific interviews, scaled by the relative impact of the challenge (with values between zero and one, representing no challenge and major challenge respectively).

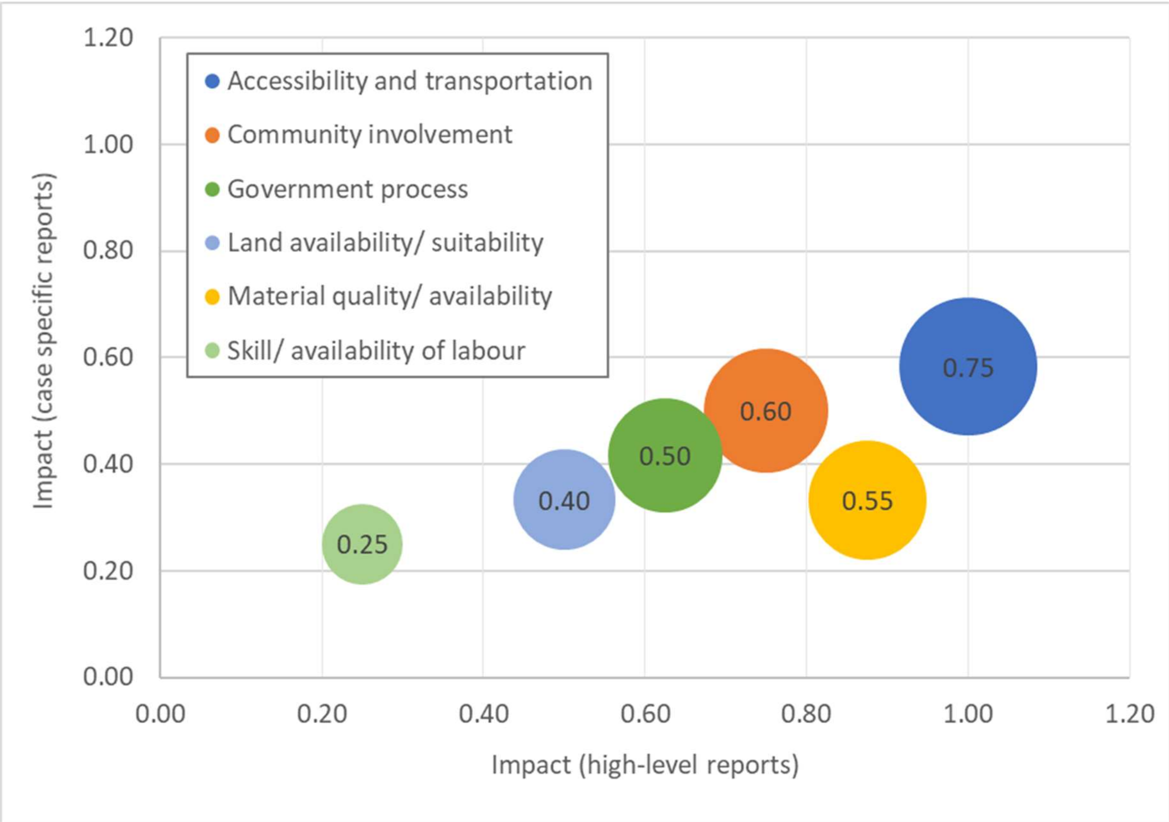

Figure 9 - Relative impact of the six challenge categories, as reported within the high-level and case specific interviews, with the size of the bubbles scaled by the combined impact score as a mean of all responses. A value of zero indicates a challenge has no impact on projects, while one indicates the challenge has a major impact.

4.1.1. Accessibility and transportation:

Participants reported a range of challenges relating to accessibility and transportation, including increased costs of transportation in less accessible areas, and difficulty transporting materials where there is no vehicular access or seasonal roads. Accessibility and transportation received relatively even reports from both high-level and case specific interviews, as can be seen in Figure 7 This suggests that there is a balanced appreciation of this challenge at both scales. One high-level participant reported: *"in inaccessible areas … we cannot transport materials [or] equipments (sic) … for reconstruction",* adding *"it is a big challenge, especially in the mountain"*, while a case-specific participant highlighted that, due to the fuel crisis at the time of the reconstruction: *"we couldn't get trucks to … carry our bricks to the site … we didn't have trucks to carry the sands and cements to the site … that was a huge problem that time, we had to face."* Another case specific participant reported delays to one phase of their reconstruction due to the monsoon, while the other, completed outside the monsoon season did not face those challenges: *"starting in the rainy season … they couldn't bring … as much as they want because of the road condition … After the rainy season it was easy"*. The awareness of this challenge was prevalent in case-specific responses, as the majority of these schools were in rural locations. This challenge was also observed by the researcher during both fieldwork visits, as depicted in Figure 10 in which a road is being reconstructed following the monsoon.

As indicated in Figure 8, it was also identified as the challenge with the greatest relative impact, with a mean impact value of 0.75. It should be noted that this represents the mean challenge across all school reconstruction efforts; however, accessibility challenges are generally greater than 0.75 in rural areas and less than 0.75 in urban areas. This is mirrored in the responses of the participants, with only the urban case study, in the outskirts of Kathmandu, reporting no challenge relating to accessibility, whilst the rest reported it as either a minor or major challenge. This is important to consider when implementing reconstruction projects, as there is little that can be done to alter the accessibility of a project site, so identifying good practice that can mitigate the challenges caused are imperative. One high-level and one case-specific participant highlighted reducing delays by avoiding construction during the monsoon season: *"we didn't want anything to be done during the rainy season … because [the] road could be like, destroyed during that time"*. Another high-level participant reported: *"we have categorised the sites according to the accessibility….easy, medium and hard…if the site is hard to reach, the contractor gets more transport cost….that's why, there is no (sic) any problem of transportation actually"*. This shows that when good practice is implemented, it can be effective in overcoming, reducing or mitigating challenges, to allow projects to proceed with fewer delays and better managed costs.

Other reports of good practice to reduce the challenge of accessibility include coordinating school reconstruction with seasonal road reconstruction projects, so that transport routes to site are reinstated prior to school construction. In areas where there is little, or no, road or vehicle access, participants reported using light-weight materials to make alternative transport methods such as porters and mules more feasible. Additionally, making use of local resources, either through purchasing from local markets, or where feasible, sourcing stone, sand, gravel, and timber locally to the site (as shown in Figure 11; however, the importance of doing this sustainably, and in accordance with government restrictions, was highlighted. This impacts upon the choice of materials used within the design and should be considered carefully within the planning phase of projects.

Figure 10 - A seasonal road being reconstructed following a landslide, using an excavator (seen back left of the image).

Figure 11 - Sand and gravel being collected from a river, next to an existing school, for use in local construction projects.

4.1.2. Community involvement and government processes:

Unlike accessibility, some challenges have discrepancies in reporting levels between high-level and case specific participants, particularly seen within the challenges relating to government and community involvement; Figure 8 shows that community involvement represented over 20% of total case-specific reports versus only 10% of total high-level reports, while this reversed for challenges relating to government, representing over 30% of the total high-level reports and less than 10% of case-specific reports. While there was more uniformity within phase two responses, these differences are also clearly shown in Figure 7 with government process receiving eight reports from high-level, and none from case-specific participants. This does not indicate that these reports are incorrect, or that one group is more accurate than the other, but that these differences occur due to the particular lens through which they view and experience the school reconstruction process. This instead makes it of additional importance when planning projects, as it highlights that different stakeholders experience and view projects differently, and this range of views must be appreciated and acknowledged effectively in order for reconstruction projects to run most successfully.

Challenges relating to the government process included: *"In the initial phase NRA was not yet established"*, *"design approved slowly"*, and as one high level participant reported *"it's a learning curve, so us working with them, I wouldn't say they have improved so much, maybe it's more that we have learnt how to…navigate the landscape"*. Another high-level participant also stated that the overall system could be improved by shifting responsibility from central to a local level, reporting: *"If you truly able to translate [and] decentralise these things to the local level, then it will work better"*, but highlighted that *"the local government, they don't have [the] capacity and resources".* This was seen in initial reconstruction efforts, and the overseeing organisations were newly established, and is something that can be considered moving forwards, and in preparation for future earthquakes, ensuring that the systems and bodies are sufficiently equipped to effectively manage and coordinate the reconstruction efforts.

The imbalance in reporting means that this challenge is underappreciated at an individual school scale or that high-level participants overemphasize the challenge based upon their areas of experience. This can be explained by challenges relating to government only becoming more obvious with experience of numerous projects, which high-level participants have, and they may not be as easy to identify within an individual case specific project, unless there was a significant delay caused by the process. It is interesting to consider the respective impact values given to this challenge by high-level and case specific participants, given the marked difference in levels of reporting. As shown in Figure 9, the mean impact across both levels is 0.5, representing a minor challenge to projects; this is split into values of 0.63 from high-level participants, versus 0.42 from case specific participants, which is to be expected given the split of reports. While the impact value was higher for high-level participants, the ranking of this against the other challenges was lower (identified as the fourth highest impact challenge) while the ranking assigned by case specific participants placed it as the third highest impact challenge. This is useful to consider when planning reconstruction projects, particularly for school or SMC led projects, or for other organisations with limited or no experience of navigating government processes, especially as this accounts for the majority of school reconstruction projects. One case-specific participant, from an organisation with no prior experience of school reconstruction reported that *"the government issues a very ongoing thing … we had to go [to] so many different offices and meet so many different officials, and get things approved, and then, now we have another government just formed … now we have to do everything from scratch again"*. However, participants also reported that ensuring designs were completed by qualified engineers made this approvals process easier, so that designs were done in accordance with the Nepal Building Code. If working on multiple projects, particularly the case for contractors and NGOs, having a range of pre-approved 'type' designs was also reported as good practice, so that gaining specific approval for individual projects based on these designs was easier. This approach could also be utilised by making use of the CLPIU-Education's standard designs, and while this can limit the functionality of the design to meet school requirements, over time the number and range of designs has increased; adding more designs to this set would also benefit. It will also be important for further work to assess the suitability and safety of these designs.

There were further challenges reported relating to government involvement, at both a local and central level, including bureaucracy, local politicians causing disruptions and delays, limited funding, and corruption. While many of these challenges are systemic in nature, and cannot be addressed fully within the scope of this paper, some elements of good practice were identified to limit the impact of these challenges, including: effective stakeholder engagement, to ensure that all actors who may influence the project are considered; working on multiple projects in a similar area to develop stronger local connections and establish better working relationships with local stakeholders; ensuring there is a process of regular supervision and checking by multiple levels (including project, district and central level engineers), to monitor quality of construction; and having a transparent approach of tracking and reporting progress (both time and financial) to minimise potential for corruption, including directing project funds through a government-registered bank account.

The opposite case is seen for challenges relating to community involvement, such as difficulties balancing community expectations with project budgets, SMCs having limited experience, and a lack of awareness of the importance of seismic-resistant features. Figure 7 and Figure 8 show that there were high rates of reporting within case specific interviews, against relatively few reports by high-level participants. This is likely due to community-related challenges being more easily identified on a case-specific basis, with perspectives drawn from direct experience with engaging with a community, or reflecting that this is the lens through which they view the project. One case-specific participant highlighted that the local community were involved in providing some contribution to the labour force, but delays were caused when *"social events took local workers away"*. When reflecting on how the project could have been improved the interview participant reported that they would *"better define the contract between NGO and community especially in community involvement and contribution"*. Another case-specific participant reported that there were lots of disputes and tensions with the local community, over where the funding had come from, what was being funded, and who was receiving the help. They reported that this had caused delays and difficulties throughout the project, and that during the school inauguration, they had to clearly outline all the decisions that had been made, to ensure the community were onboard with the project. As highlighted for government involvement, ensuring effective stakeholder engagement throughout the process can also work to mitigate this challenge. One participant also highlighted the practice of providing training for NGO staff in social mobilisation and community engagement, to ensure that this process is done well.

This challenge was also reported to have the lowest impact, of only 0.25, by both case specific and high-level participants, as seen in Figure 9. Four of the six case-specific interviews ranked community involvement as "No challenge", as well as two of the four high-level interviews. This was influenced by participants reporting either a positive experience of community involvement, or through implementing good practice to mitigate against the potential challenges highlighted. It was also highlighted that community engagement is unpredictable, and it is important to not make assumptions about the level of engagement, or potential issues that may arise within this area. Participants reported a range of good practice including: *"members from school management committee … we provide them (sic) … one day training [on] project management"*; *"Whenever a school was being constructed, the School Management Committee was always brought into the meetings and orientations, and that's how they were involved as a community.";* and, when involving the community in some of the tasks linked with the construction, such as sourcing local materials, *"there was a partnership we had with the locals, … we wanted to make sure … they feel … they have the ownership of the school as well. It's not that the school is going down there (sic) and we are building it for them."*. While the mean impact of this challenge is lower than the others, it should be considered in all future work, as, when not well managed, it can still have a negative impact on projects. As such, it requires implementation of good practice to ensure good management and engagement to effectively work with communities and mitigate the potential challenges that may arise.

4.1.3. Land, labour and materials

The other challenges considered, while not seen as extreme cases in either the relative impact, or as diverse perceptions by different stakeholders, still present difficulties and barriers to effectively and safely reconstruct schools. For example, the skill and availability of labour can have significant repurcussions on both project timescales and quality of construction. One case study participant reported that the overall span of construction covered approximately 2.5 years, although only seven to eight months of this was effective construction time, due to *"several interuptions and lack of manpower".* There were many reports of insufficient labour such as one report stating: *"mass reconstruction is taking place in private sector as well … and there is scarcity of the labour"*. One participant also highlighted that these shortages caused an increase in costs for labour: *"there the unskilled labour charge per day is 500 [NPR] [4.25 USD], and in an earthquake hit areas it's 1000 [NPR] [8.50 USD]"*. This can have knock-on impacts to the overall project budgets and spending. Participants also reported issues relating to the skill of labourers, for example one case specific participant highlighted that *"the labourers were not quite as skilled for the new type of building"*, while another reported that it was agreed that the labour would be sourced from the local area but *"our contractors were limited to certain things … they couldn't get the skilled labour out there, so they had to take few from Kathmandu"*. Training plays a key role in mitigating or overcoming these challenges, with reports from seven of the ten phase two interview participants (four case-specific and three high-level). This was reported across three main aspects of training: working with labourers who had received training on previous projects; providing on-the job training within the current project underway; and broader training to increase the number of masons and labourers. Other reported good practice included *"intensive research of manpower, [and] negotiation with local community"*, or "*[hiring] the professional contractor [for] technology transfer"*, to improve long term skills and access to technology, beyond the span of the reconstruction project. Working on multiple projects in a similar area, particularly where investment in training and technology transfer has been provided, can help improve long term engagement with labour, and could work to increase the efficiency of projects. Participants also reported the importance of ensuring that designs were suitable and translated for field level, to ensure that these were understandable and masons were able to follow them.

Another case study experienced delays of three to four months for starting construction due to *"issues of misunderstanding with [the] land"*, caused by disputes over ownership and rights to the land. One high level participant highlighted that schools were often constructed on land donated by the communities, but this raised issues of the quality and safety of the land: *"donated land is not always suitable for school construction. They are in the different terraces….and with the very steep contour, steep hill slopes which are vulnerable to landslides"*. Evidence of this was also seen when exploring the broader research context: at a school in the north of Sindhupalchowk district, shown in Figure 12, which was damaged by debris flow from the hill slope behind the school; and a school right on the bank of a river, constructed on stilts, shown in Figure 11. Another high-level participant reported that for one school reconstruction project they were involved in was unable to go ahead as there was no suitable land available: *"in one site, it never got started though….the only land they were able to contribute was completely unsafe".* It is important that the suitability of land is assessed prior to construction, when initiating a school reconstruction project, so that a suitable site can be located, or potential hazards can be identified and accounted for from the start, in order to be addressed properly; this may include undertaking additional work to flatten site, or employing geotechnical engineers to construct suitable retaining walls to reduce landslide risk.

Materials can also present a challenge for projects. A range of construction materials were identified across the case-specific and high-level interviews, including reinforced concrete, fired bricks, CSEB, stone, steel sections, CGI sheeting, and timber. However, choosing the most appropriate material can be difficult, as one high-level participant reported: "*The key is that, none of the materials that we see are perfect for all of Nepal".* This requires organisations and projects to carefully select which materials to use to be most suitable at a specific project site, or may face challenges if using materials not best suited to that context. Across high-level and case-specific interviews, a range of challenges relating to materials were reported. Poor quality materials were affecting the quality of construction and increasing costs, as one participant stated: *"over the time of the earthquake, er, reconstruction, and increasingly construction, materials have deteriorated and prices have [increased]*". This was also echoed by academics in the field of engineering, who highlighted this decrease in material quality, and the risks associated with using sub-standard materials, for example not dressing stones to be regular shapes, and not using corner- or through stones within masonry construction. This increase in material cost was driven by the shortages of materials seen, as one participant reported, *"mass reconstruction is taking place in private sector as well … and there is scarcity of the labour…and materials in some cases."*. Storage of materials was also highlighted as a challenge, particularly for cement, sand, gravel and bricks, with one case-specific participant reporting that due to having to store materials outside, this space was no longer available for students to use, throughout the duration of the construction, as shown in Figure 13. Participants reported a range of practices to overcome the challenges highlighted, including evaluating materials based on technical, social and economic viability for each site, accounting for higher material costs to be able to purchase higher quality materials, transporting materials prior to the monsoon to reduce delays, and as one high-level participant reported, improving the quality of the materials used through better preparation: *"what we target is the bottleneck, increase the efficiency of cutting and dressing the stones, where especially the corner and through stones are very important for the earthquake resistance"*.

Figure 12 - A school in north Sindhupalchowk, damaged by debris flows

Figure 13 - Construction materials being stored in the open, on land students previously used for outdoor activities.

5. Conclusions and future work

The results of two field studies to Nepal have been presented, with data collected within nineteen interviews, and one online questionnaire, with a range of stakeholders, representing both high-level and case-specific involvement in Nepal's school reconstruction efforts following the 2015 Gorkha earthquake. These visits took the form of a pilot study, to identify key challenges and other areas of interest to investigate, and a follow up phase two study, to explore these areas in greater detail. To support the interview findings, other research activities were also conducted, including visits to schools and earthquake-affected communities, and meeting with experts and stakeholders involved in broader resilience and recovery efforts.

From the individual challenge narratives reported in the pilot study interviews, six key challenge categories affecting school reconstruction were identified: 1) accessibility and transportation, 2) skill and availability of labour, 3) government process, 4) the quality and availability of materials, 5) suitability and availability of land, and 6) community involvement. These challenges vary in frequency and impact, the perception of each challenge differ between case-specific and high-level participants, and the challenges are dependent on the context of the project.

Accessibility and transportation (including delays in material delivery due to seasonal roads, damage to materials on poor quality roads, and the high costs associated with accessing hard to reach communities) had the highest reported impact on projects (0.75 out of 1). Conversely, community involvement (including lack of community engagement and designs not fulfilling the needs of the school) was reported to have the least impact (0.25); however, this is not to say that community involvement is not important for these projects, but rather reflects that in the majority of schools studied, the implementation of good practice reduced the impact experienced due to this. Challenges relating to land, community involvement and government processes also highlighted imbalances in levels of reporting between high-level and case-specific participants, suggesting areas which may be underappreciated at either field level or in broader coordination efforts.

A range of good practice that stakeholders had implemented has been highlighted, including: 1) training in construction methods, for projects using unskilled and volunteer labour 2) project management training for SMCs, within SMC led projects 3) training NGO staff for community mobilization; 4) early identification of higher costs for transportation, for projects in rural areas 5) communicating and instilling an appreciation of the benefits of higher-quality materials, which may incur increased costs in the short-term; and 6) planning work to avoid disruption due to the monsoon, in the case of areas that are only accessible by seasonal roads.

Seventy five percent of school reconstruction projects are overseen by SMCs, with little or no experience of construction project management. We argue that this limits the potential for knowledge transfer of good practice between projects, stakeholders and organizations, resulting in inefficiencies in the process, for both time and resources. This indicates a need for more resources and ss to assist in the school reconstruction process, to identify potential challenges for each specific project, and appropriate good practice, to improve project delivery for that project.

Choosing the most appropriate good practice is critically dependent on the context of the project. Therefore, further work will seek to collate the reported challenges, contexts, and good practice, in order to produce an interactive decision-making tool that can assist in this knowledge transfer, systematically working through all the factors that must be considered within the project and enabling users to identify appropriate good practice for their specific project context. This will aid in Nepal’s ongoing approach of building back better and safer, and ensuring that future school infrastructure is resilient.

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Appendix B:

Fieldwork risk assessments

Appendix B. Fieldwork risk assessments

B.1. Pilot study risk assessment

Figure B-1 – Pilot study itinerary

Summary of Travel (Please provide a summary of your work activity/ project/ research which requires you to travel)		
Travel is in order to carry out PhD research exploring school reconstruction in Nepal. The following activities will be undertaken (full itinerary/schedule included overleaf): Visiting case study schools across Nepal (most within the Central Region), carrying out interviews with school representatives, community members, project engineers, managers and labourers Visiting organisations/NGOs involved in school reconstruction projects at their offices (most in Kathmandu), carrying out interviews with engineers and project managers Visiting earthquake affected communities and monitoring stations (organised by Durham University staff) (accommodation and travel for this arranged by Durham university – details provided below)		
 **Meetings/ events/ research or fieldwork locations**		
Date(s)	**Description of activity**	**Venue/ location/ telephone**
06/10/17-10/11/17	Visiting projects and monitoring stations, and discussing research projects. (Organised by Dr N J Rosser, Durham University)	Upper Bhote Kosi Valley, Listikot, Sindhupalchowk, Nepal. 0044 7833046036 / +977 1 4700525 or +977 4701247
11/10/17	Meeting with [Name]	[Contacts]
12/10/17	Earthquake tour of KTM, led by NSET, plus visit to library and museum. (Organised by Dr N J Rosser, Durham University)	Kathmandu, Nepal. 0044 7833046036
13/10/17	am: ICIMOD re library and geospatial data (Deo Raj Gurung / Mandira Shrestha). Pm: Tribhuvan University Dept of Geography. (Organised by Dr N J Rosser, Durham University)	Kathmandu, Nepal. 0044 7833046036
14/10/17-15/10/17	Visit to Nurgakot. Durham alumni meeting - experience and knowledge sharing for doing research in Nepal.	Nurgakot, Nepal. 0044 7833046036
16/10/17	NSET, tour of community based work, school safety program, landslide risk assessment. [Name]	NSET, [Address]
18/10/17	Meeting with [Name]	[Contacts]
22/10/17-30/10/17	Visits to case study schools, with [NGO] – to be discussed and arranged on arrival and on meeting with [Name]	Details and locations to be confirmed. [Contacts]
01/11/17-07/11/17	Visits to case study schools in Kathmandu, [NGO] - to be discussed and arranged on arrival and on meeting with [Name]	Details and locations to be confirmed. [Contacts)

Figure B-2 – Pilot study risk assessment

What are the hazards (bold text)/ risks (bullet points)?	**What controls have you put in place?**
Accommodation Physical defects Risk of fire Risk of robbery, physical or sexual assault Terrorist incident e.g. bomb Falls from balcony's Earthquake – building collapse	Where possible accommodation will be in modern hotels, designed to seismic codes, if available. Advice will be sought from supervisors or contacts for recommended accommodation. If available, 4 star accommodation will be found, to hopefully ensure higher quality and safety of facilities. However, in more remote regions this may not be available. In rural communities, where possible, accommodation will be found in seismically designed buildings, and where not, in lightweight ductile structures if available. If available, avoid accommodation situated on or under slopes with a landslide risk Identify evacuation routes from all rooms visited, including accommodation and case study schools, and be aware of any evacuation and general earthquake safety procedures in place Monitor USGS site for increased seismic activity
Work activity Risks from work activities including fieldwork e.g. Operating machinery Hazardous substances Visiting live construction sites – possibility of collapse, exposure to cement or wet concrete, trips, tools	Wear appropriate PPE as advised by on-site personnel e.g. engineer or mason. Only go into buildings under construction when accompanied by on-site personnel Be aware of and take caution around on-site hazards such as wet concrete, discarded tools – researcher will only be present to view works and will not take any role in construction.
Travel and transportation Risk of theft/ attack at airport or on public transport Road traffic accident whilst self-driving or passenger in taxi or other vehicle Carjacking or road blocks Struck by vehicle whilst walking Falls from vehicles Poor road infrastructure Density of traffic Poor driving standards Poorly maintained vehicles Lack of emergency response or help after accident	Travel will be arranged either through partner organisations in their vehicles, or through alternative local drivers, in vehicles suitable to the terrain. Take local advice on road conditions, flood precautions, accessibility Local drivers will be supplied by trusted hire companies known to local contacts if available.
Location and or regional factors Crime- risk of robbery, physical or sexual assault Kidnap and ransom Terrorist attacks/ bombs Political instability Corruption- requests for bribes Remote working	Ensure there are back-ups of contact details Have agreed schedule for communicating with supervisors to update on progress and any problems that arise If available, researcher will purchase Nepali sim card to provide a more reliable means of communication (this may not be possible). Keep supervisors and partners up to date with the planned itinerary and any changes

What are the hazards (bold text)/ risks (bullet points)?	What controls have you put in place?
Poor communications Religious tensions Cultural misunderstandings e.g. clothing, alcohol or other behaviour	Foreign office advice – be vigilant in public places and take local advice Avoid lone travel where possible, should be accompanied by a local (either driver, member of a partner organisation, or school representative). Details of these persons will be provided in advance on the detailed itinerary, or updates will be emailed to supervisors if arranged in country. Where it is not possible to travel accompanied, the researcher will agree a formal schedule of when contact will be made with supervisors and in-country contacts, to update on progress and report any issues. Researcher has travelled to remote areas of Nepal before so is aware of some of the challenges this may pose, so will be better prepared to deal with issues that may arise. There is no additional risk of terrorism in Nepal than elsewhere
General health/ environmental factors Natural disasters e.g. floods/ cyclones/ earthquakes Food and drink (poor hygiene) Infectious diseases Biting insects or animals including risks from rabies, malaria, Zika virus etc. Poor or distant medical facilities Sexually transmitted diseases	Travel has been arranged for peak tourist season, when environmental hazards are minimised. Although currently in monsoon season and experiencing flooding, this should have ended by the time of the visit, but conditions will be routinely checked, to identify any prolonged hazards that may affect the itinerary Identify methods of communication to notify authorities of emergency situations Ensure adequate supply of provisions in case of prolonged stays due to access Ensure suitable clothing for wet/hot/cold weather Assess daily weather conditions that may affect activities and travel Seek local advice Ensure wearing appropriate sun protection, use insect repellent and keep skin covered when possible There is a low risk of malaria, and anti-malarials are not recommended Hepatitis A, tetanus and typhoid vaccinations are recommended. Up-to-date vaccinations are typhoid, diphtheria, tetanus, polio, hepatitis A and B, Japanese encephalitis B, rabies and cholera Drink bottled water, and always carry water Filter and treat water from other sources using Chlorine purification tablets Avoid eating ice, uncooked vegetables and salads. Where possible eat at trusted establishments Identify medical facilities near to each case study location
Individual factors Disability Level of cultural awareness Inability to speak Language Cultural/ religious or sexual orientation leading to increased risk Pre-existing medical conditions, physical injuries or weaknesses	In general, particularly in rural areas, lone travelling will be avoided, and the researcher will be accompanied by a local driver, interpreter, representative from NGOs etc. Details of these persons will be provided in advance on the detailed itinerary, or updates will be emailed to supervisors if arranged in country. Where it is not possible to travel accompanied, the researcher will agree a formal schedule of when contact will be made with supervisors and in-country contacts, to update on progress and report any issues.

What are the hazards (bold text)/ risks (bullet points)?	**What controls have you put in place?**
or mental health conditions requiring management	Researcher has travelled to remote areas of Nepal before so is aware of some of the cultural and religious differences. If available, researcher will be accompanied by an interpreter, particularly in remote regions where there may not be English speakers.
Other hazards Loss of passport and other documents	Contact the British Embassy in the event of losing passport and other required documents – details are provided above.

B.2. Phase two risk assessment

Figure B-3 – Phase two itinerary

Summary of Travel (Please provide a summary of your work activity/ project/ research which requires you to travel)		
Travel is in order to carry out PhD research exploring school reconstruction in rural Nepal. The following activities will be undertaken (full itinerary/schedule included overleaf): Visiting case study schools across Nepal (most within the Central Region), carrying out interviews with school representatives, community members, project engineers, managers and labourers Visiting organisations/NGOs involved in school reconstruction projects at their offices (most in Kathmandu), carrying out interviews with engineers and project managers		
 **Meetings/ events/ research or fieldwork locations**		
Date(s)	**Description of activity**	**Venue/ location/ telephone**
TBC – Proposed 08/10/18	Meeting with [Name]	[Contacts]
01/10/18	Meeting with [Name]	[Contacts]
03/10/18 – 15/10/18	Visits to case study schools, with [NGO]	Details and locations to be confirmed. [Contacts]
24/10/18 – 02/11/18	Visits to case study schools, with [NGO]	Details and locations to be confirmed[Contacts]
03/10/18	Visit to [School]	[Contacts]
04/10/18	Visit to [School]	[Contacts]
05/10/18	Visit to [School]	[Contacts]

Figure B-4 – Phase two risk assessment

What are the hazards (bold text)/ risks (bullet points)?	**What controls have you put in place?**
Accommodation Physical defects Risk of fire Risk of robbery, physical or sexual assault Terrorist incident e.g. bomb Falls from balcony's	Where possible accommodation will be in modern hotels, designed to seismic codes, if available, and where available and reasonable cost, 3 star accommodation will be found, to hopefully ensure higher quality and safety of facilities. Advice on suitable hotels will be sought from contacts, supervisors, Selective Travel, and researcher's own experience, selecting hotels that are well recommended and reviewed. The researcher has previously stayed in The Yellow House, and this hotel is frequently used by contacts at Durham University, and was found to be suitable. Particularly in rural communities it may not be possible to meet the above criteria, and common sense and local knowledge and experience will be used to identify suitable accommodation. Where possible, accommodation will be found in seismically designed buildings, and where not, in lightweight ductile structures if available. If available, avoid accommodation situated on or under slopes with a landslide risk. Researcher will identify evacuation routes from buildings visited, including accommodation and case study schools, and be aware of any evacuation and general earthquake safety procedures in place

What are the hazards (bold text)/ risks (bullet points)?	**What controls have you put in place?**
	Monitor USGS site for increased seismic activity
Work activity Risks from work activities including fieldwork e.g. Operating machinery Hazardous substances	Wear appropriate PPE as advised by on-site personnel e.g. engineer or mason. Only go into buildings under construction when accompanied by on-site personnel Be aware of and take caution around on-site hazards such as wet concrete, discarded tools – researcher will only be present to view works and will not take any role in construction. Researcher has experience working on construction sites both in the UK and Nepal, and is aware of general good safety practice and identifying potential risks
Travel and transportation Risk of theft/ attack at airport or on public transport Road traffic accident whilst self-driving or passenger in taxi or other vehicle Carjacking or road blocks Struck by vehicle whilst walking Falls from vehicles Poor road infrastructure Density of traffic Poor driving standards Poorly maintained vehicles Lack of emergency response or help after accident	Travel will be arranged either through partner organisations in their vehicles, through local travel companies, or through alternative local drivers, in vehicles suitable to the terrain. Take local advice on road conditions, flood precautions, accessibility Local drivers will be supplied by trusted hire companies known to local contacts if available.
Location and or regional factors Crime- risk of robbery, physical or sexual assault Kidnap and ransom Terrorist attacks/ bombs Political instability Corruption- requests for bribes Remote working Poor communications Religious tensions Cultural misunderstandings e.g. clothing, alcohol or other behaviour	A back-up hard copy of contact details will be available, Have agreed schedule for communicating with supervisors to update on progress and any problems that arise If available, researcher will purchase Nepali sim card to provide a more reliable means of communication (this may not be possible). Supervisors will be kept up to date with the progress of the planned itinerary and any changes, and the risk assessment will be updated to reflect these changes Foreign office advice – be vigilant in public places and take local advice Avoid lone travel where possible, should be accompanied by a local (either friend, driver, member of a partner organisation, school representative, interpreter or similar). Details of these persons will be provided in advance on the detailed itinerary, or updates will be emailed to supervisors if arranged in country. Where it is not possible to travel accompanied, the researcher will agree a formal schedule of when contact will be made with supervisors and in-country contacts, to update on progress and report any issues. Researcher has travelled to remote areas of Nepal before so is aware of some of the challenges this may pose, so will be better prepared to deal with issues that may arise. There is no additional risk of terrorism in Nepal than elsewhere

What are the hazards (bold text)/ risks (bullet points)?	**What controls have you put in place?**
General health/ environmental factors Natural disasters e.g. floods/ cyclones/ earthquakes Food and drink (poor hygiene) Infectious diseases Biting insects or animals including risks from rabies, malaria, Zika virus etc. Poor or distant medical facilities Sexually transmitted diseases	Travel has been arranged for peak tourist season, when environmental hazards are minimised. The visit is scheduled for once the monsoon has finished, so risk of flooding is decreased and road conditions will be improved. However, conditions will be routinely checked to identify any prolonged hazards that may affect the itinerary Identify methods of communication to notify authorities of emergency situations e.g. in the case of an earthquake, contact the British Embassy (details above) Ensure adequate supply of provisions in case of prolonged stays due to access Ensure suitable clothing for wet/hot/cold weather Assess daily weather conditions that may affect activities and travel Seek local advice Ensure wearing appropriate sun protection, use insect repellent and keep skin covered when possible There is a low risk of malaria, and anti-malarials are not recommended Hepatitis A, tetanus and typhoid vaccinations are recommended. Up-to-date vaccinations are typhoid, diphtheria, tetanus, polio, hepatitis A and B, Japanese encephalitis B, rabies and cholera Drink bottled water, and always carry water. Filter and treat water from other sources using Chlorine purification tablets Avoid eating ice, uncooked vegetables and salads. Where possible eat at trusted establishments Identify medical facilities near to each case study location
Individual factors Disability Level of cultural awareness Inability to speak Language Cultural/ religious or sexual orientation leading to increased risk Pre-existing medical conditions, physical injuries or weaknesses or mental health conditions requiring management	In general, particularly in rural areas, lone travelling will be avoided, and the researcher will be accompanied by a local driver, interpreter, representative from NGOs etc. Details of these persons will be provided in advance on the detailed itinerary, or updates will be emailed to supervisors if arranged in country. Where it is not possible to travel accompanied, the researcher will agree a formal schedule of when contact will be made with supervisors and in-country contacts, to update on progress and report any issues. Researcher has travelled to remote areas of Nepal before so is aware of some of the cultural and religious differences. If available, researcher will be accompanied by an interpreter, particularly in remote regions where there may not be English speakers.
Other hazards Please change hazard title and enter additional hazard(s) as required.	Contact the British Embassy in the event of losing passport and other required documents – details are provided above.

Appendix C:

Fieldwork interview protocols

Appendix C. Fieldwork interview protocols

C.1. Pilot study interview protocol

Objective of the research

A series of questionnaires will be conducted as part of PhD research exploring barriers and challenges within post-earthquake school reconstruction in Nepal. The final expected outcome of this PhD research is to identify good practice and generate guidance to improve the overall delivery of post-earthquake school reconstruction in Nepal, and means for this to also be disseminated into pro-active retrofitting actions in Nepal and elsewhere. This may include the identification of and designation of locations in which organisations work, the choice of materials and technologies used, and training for workforces to ensure building quality.

This set of questionnaires will be the first of three or four conducted throughout the project. The purpose of this set of questionnaires and interviews is to familiarise the researcher with conducting interviews to help identify the most beneficial questioning techniques and styles and rapport. As well as this, the interviews will be used to collect preliminary data that will be used to inform the focus of the study, narrowing down the scope of the project, identifying key challenges to be explored further.

Participants

These will be conducted with representatives from NGOs involved in school reconstruction, as well as following a number of case study schools, interviewing school representatives, engineers and NGO representatives involved in the project. The interviews will take place in Kathmandu and at schools in several of the earthquake-affected districts. Several preliminary schools have been identified as potential case studies and more will be confirmed following discussions, once in country, between the researcher and organisations, identifying suitable reconstruction projects.

Questions

The questions asked as part of this study are designed to set the scene for the current stage of recovery following the 2015 earthquakes, both at specific schools and across Nepal as a whole. This will include questions on the number of schools damaged, the extent of damage at individual schools, the disruptions caused by this, and the timescale of recovery and current school provisions.

Factors influencing the reconstruction will also be explored, with questions on the types of materials and technologies being used and the reasons for selecting these, whether this is due to resource availability and accessibility, knowledge, or funding. Questions about the location and setting of projects will also be asked, exploring how accessibility may influence the quality of reconstruction.

The research will also explore the overall structure of the field of school reconstruction in Nepal, with questioning exploring how the different organisations involved are linked, co-ordination of projects, where responsibilities lie, and funding sources.

Interview conduct

- Interviews will be conducted on a one-to-one basis, except where language is a barrier, for which an interpreter will be used. The researcher will brief the interpreter prior to conducting the interview, to ensure they are aware of the purpose and scope the of the study, the expected outcomes of the interview, and the need to maintain anonymity and confidentiality. Signed consent and agreement of this from both interviewee and interpreter will be gained before conducting the interview.

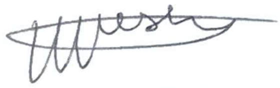
- The interviews will be audio-recorded to allow a full transcript to be written following the interview. Written notes will also be taken throughout as prompts for the researcher.
- Prior to conducting the interview, participants will be ensured that all answers will be kept anonymous and confidential.
- Prior to conducting the interview, participants will be briefed on the context, purpose and scope of the research and the potential for follow up interviews and further research.
- Prior to conducting the interview, participants will be informed that they are not obligated to be part of the research and are free to leave at any point in the process, and their results removed. They will also be reassured that they are not required to answer any question they do not wish to answer.
- The researcher will ensure that participants understand that the researcher's role is not to assess or pass judgement on safety or building quality, but just to observe, and that researcher will not be in a position to escalate concerns.
- All consent and identifying information will be kept separately from interview responses.

Obligations

The researcher confirms consent from all participants will be collected prior to conducting any interviews. The researcher will ensure that all data will be kept securely, and all responses collected will remain anonymous and confidential.

The researcher's role will just be to conduct interviews and observe reconstruction projects. The researcher is not qualified to and will not be in a position to sign off or assess building quality or safety in any way, and participants within this research will be briefed on this, so as not to give unrealistic expectations of the research. The researcher will not be in a position to escalate any concerns over building quality or safety, or the conduct of reconstruction projects within organisations in Nepal. However, the researcher agrees that any serious concerns of safety will be expressed to supervisors who have agreed to discuss and take any adequate action they feel would be required and appropriate.

Signed:



Date:

27/09/17

C.2. Phase two interview protocol

Objective of the research

A series of interviews will be conducted as part of PhD research exploring barriers and challenges to reconstructing schools in rural areas of Nepal, following the 2015 earthquakes. The final expected outcome of this PhD research is to identify good practice and generate guidance to improve the overall delivery of post-earthquake school reconstruction in rural Nepal, and ways for this to also be disseminated into pro-active retrofitting efforts in Nepal and elsewhere. This may include the identification of and designation of locations in which organisations work, the choice of materials and technologies used, and training for workforces to ensure building quality.

This set of interviews will be conducted during Phase 2 visits to Nepal, following on from a Phase 1 pilot study visit. The findings of the research conducted during the Phase 1 visit have informed the style and focus of these Phase 2 interviews.

Participants

The first interview questions covers the wide scale challenges involved with rural school reconstruction, and will be conducted with representatives from NGOs, academics and government personnel. These interviews will generally take place in Kathmandu, in offices of the participants or other suitable locations. Several participants have already been identified and agreed to take part in this research, although more links to additional participants may be established once in Nepal.

The second interview schedule focuses on specific case study schools and will be conducted with different stakeholders involved in these reconstruction projects, such as NGO representatives, engineers, and representatives from the school or community. The interviews will take place in Kathmandu and at schools in several of the rural areas of earthquake-affected districts. Several preliminary schools have been identified as potential case studies and more will be confirmed following discussions, once in country, between the researcher and organisations, identifying suitable reconstruction projects.

Questions

The questions asked as part of this study are designed to help the researcher understand more about the process of, and challenges involved with, school reconstruction in rural areas of Nepal. Questions cover:

- The impact to schools from the earthquake
- Coordination and impact of the subsequent reconstruction efforts
- The design of school reconstruction projects, the facilities provided and materials used
- The implementation of reconstruction projects, including initiation, funding and timescales
- The challenges faced affecting school reconstruction, and mitigating actions to reduce these
- Factors about the communities in which these schools are located

The interview schedules do not differentiate questions dependent on the role of the participant, in order that there is continuity in the study and allow for direct comparisons between responses. However, some questions may not be relevant to all participants. Therefore, it will be explained to all participants that they are entitled to not answer a question they do not feel able to answer. The interviewer will also exercise discretion when conducting the interviews, and may miss questions if they feel the participant has demonstrated that they would not be able to answer it, in order that participants do not feel uncomfortable.

Interview conduct

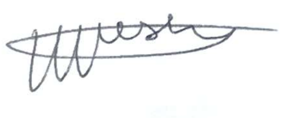
- Interviews will mostly be conducted on a one-to-one basis, except where language is a barrier, for which an interpreter will be used. The researcher will brief the interpreter prior to conducting the interview, to ensure they are aware of the purpose and scope of the study, the expected outcomes of the interview, and the need to maintain anonymity and confidentiality. Signed consent and agreement of this from both interviewee and interpreter will be gained before conducting the interview. Where possible, the interpretation will not be provided by another stakeholder in the study, although due to the nature of the fieldwork, this cannot be guaranteed.
- The interviews will be audio-recorded to allow a full transcript to be written following the interview. Written notes will also be taken throughout as prompts for the researcher.
- Prior to conducting the interview, participants will be ensured that all answers will be kept anonymous and confidential.
- Prior to conducting the interview, participants will be briefed on the context, purpose and scope of the research and the potential for follow up interviews and further research.
- Prior to conducting the interview, participants will be informed that they are not obligated to be part of the research and are free to leave at any point in the process, and their results removed. They will also be reassured that they are not required to answer any question they do not wish to answer.
- The researcher will ensure that participants understand that the researcher's role is not to assess or pass judgement on safety or building quality, but just to observe, and that researcher will not be in a position to escalate concerns.
- All consent and identifying information will be kept separately from interview responses.

Obligations

The researcher confirms consent from all participants will be collected prior to conducting any interviews. The researcher will ensure that all data will be kept securely, and all responses collected will remain anonymous and confidential.

The researcher's role will just be to conduct interviews and observe reconstruction projects. The researcher is not qualified to and will not be in a position to sign off or assess building quality or safety in any way, and participants within this research will be briefed on this, so as not to give unrealistic expectations of the research. The researcher will not be in a position to escalate any concerns over building quality or safety, or the conduct of reconstruction projects within organisations in Nepal. However, the researcher agrees that any serious concerns of safety will be expressed to supervisors who have agreed to discuss and take any adequate action they feel would be required and appropriate.

Signed:



Date:

24/09/18

Appendix D:

Pilot study interview schedules

Appendix D. Pilot study interview schedules

D.1. Case-specific interview pack

School Reconstruction in Nepal: Case-Specific Interview
Purpose of the research:
This pack contains a set of questionnaires to be asked to school representatives, engineers and NGO representatives involved with the case study school reconstruction projects. The questions cover: the impacts of the earthquake on the school buildings, the reconstruction process, and the organisational involvement with the project. The general purpose of these questionnaires is to establish basic details of the case study school, including identifying features, background and details of the project. This is not designed to provide specific, quantifiable data, but instead provide observations which will help limit and direct the focus of later, more in-depth questionnaires. Any participant in this research is free to leave the study at any time, and is not required to answer any question they do not feel comfortable answering. The purpose of these questionnaires is not to validate the safety of any reconstruction projects. The interviewer is not qualified to assess the safety of any buildings, and will be unable to act on information regarding any potential safety issues raised.
Confidentiality:
This research is being conducted as part of PhD research conducted at Newcastle University, UK. All data, responses and photographs collected will be confidential and stored securely on university hard drives, only shared with the primary researcher and supervisors, and will be disposed of securely on completion of the research. Where data and responses will be used within publishable work, all responses will be kept anonymous.
Audio recording:
The audio of the interviews conducted may be recorded. The recordings will be stored securely on university hard drives. The recordings will be used to provide a full transcript of the interviews, to ensure that responses are recorded accurately. A second interpreter may also be used to verify translations, if there is confusion over answers provided.
Permission:
I, _________________________, as a representative of the school, consent to take part in this research, and understand that all data provided will be used anonymously. I consent to an audio recording of the interview being taken. Signed:_________________________
I, _________________________, within my role as engineer on the school reconstruction project, consent to take part in this research, and understand that all data provided will be used anonymously. I consent to an audio recording of the interview being taken. Signed:_________________________
I, _________________________, as a representative of the NGO on the school reconstruction project, consent to take part in this research, and understand that all data provided will be used anonymously. I consent to an audio recording of the interview being taken. Signed:_________________________
I, _________________________, within my role as interpreter for the interviews conducted, agree to provide a full and accurate interpretation of all questions and answers provided. I consent to an audio recording of the interviews being made and used for the purposes of this research. Signed:_________________________

School Profile		
School name:		
Location:		
City/town/village: VDC (if applicable):		
Organisations involved:		
Contact details:		
Name: Role: Phone: Email:	Name: Role: Phone: Email:	Name: Role: Phone: Email:

Details of the school:
Location:
Distance from Kathmandu (miles):
Distance from Kathmandu (time):
Accessibility:
Location of school within community:
People:
Age range of pupils:
Number of pupils:
Number of staff:
Facilities: (Prior to the earthquake)
Number of buildings:
Number of classrooms:
Number of storeys:
Toilets:
Assembly spaces:
Outside facilities:
Other facilities: (e.g. staffroom)

Impacts of the Earthquake:	School representative
Participant number: Position: Roles and responsibilities within the project:	
School damage due to the earthquake:	
How many buildings were no longer usable? How many buildings were damaged but still usable?	
Disruption to teaching:	
When was the initial disruption? Did the school have to shut temporarily? Was that immediately after the initial disruption or was there a delay? If any temporary buildings were provided, when were these put in place? When were children able to return to school?	
Temporary buildings:	
Who was responsible for and involved in the provision of any temporary buildings? What temporary buildings were provided? If any, how were these temporary buildings selected? How long did you have to remain in the temporary buildings? On a scale of 1-10, with 1 being not at all suitable, and 10 being fully functional, how suitable were the temporary buildings? How long were you willing to remain in the temporary buildings?	
Are there any other hazards that effect school buildings and facilities?	

Reconstruction:	School representative
Participant number: Position: Roles and responsibilities within the project:	
At what stage do you think the current school reconstruction project is at?	
Reconstruction project timescale:	
When was the project initially agreed? When was the design confirmed? When did the construction work begin? If completed, when did construction work finish? How long after construction work finishing were children able to return to school?	
Has anything negatively affected the construction process?	
School design:	
How well do you feel the engineer/NGO engaged with you during the reconstruction process? Did the school have any say in the overall design of the new school and the facilities provided? On a scale of 1-10, how safe do you feel in the new school buildings? Was there anything that was not included in the school reconstruction that you would have wanted? Were there reasons these were not possible?	

Organisational involvement:	School representative
Participant number: Position: Roles and responsibilities within the project:	
Which organisations and groups have been involved in the reconstruction project, and what roles did they play?	
School representatives: Community: NGOs: Engineers: Government: Others:	
How was the project initiated?	
How was the project financed?	
If any, what were the challenges involved in each stage of the project?	
Initial set up of the project and the team: Agreeing a suitable design: Constructing the design: Others:	

End of interview

Reconstruction:	Engineer
Participant number: Position: Roles and responsibilities within the project:	
At what stage in the project is the current school construction?	
Timescale of the reconstruction project:	
When was the project initially agreed? When was the design confirmed? When did the construction work begin? If completed, when did construction work finish? How long after construction work finishing were children able to return to school?	
Quality of the reconstruction:	
On a scale of 1-10, how would you rate the quality and success of the reconstruction project? Has anything negatively affected the construction process?	
Design process:	
What materials and technologies have been used in the reconstruction? How much control over the design did you have, including layout and materials? If not you, who was the driver behind the selection of materials and technologies? Were there other considerations that were taken into account when choosing materials, such as costs or material shortages, and what impact did these have?	

If different from those used, what materials and technologies would have been preferable, if the barriers to implementing them were not in place? When considering seismic resistance, how do these options compare against the implemented technologies? Did the head teacher and school representations have a say in the design of the new school and the facilities provided?
Labour:
How were the labourers selected for the reconstruction? How much training for the labourers was required? On a scale of 1-10, how would you rate the skill and proficiency of the labourers to construct to the design?
Were you involved in the provision of the temporary structures prior to the construction of the permanent school?
If yes, what structures were used, and were they earthquake resistant? If yes, how were these structures chosen? If yes, what the intended life span of these structures, and how did this compare to the length of time they were used? Were the temporary structures incorporated into the design of the permanent structure?

Organisational involvement:	Engineer
Participant number: Position: Roles and responsibilities within the project:	
Which organisations and groups have been involved in the reconstruction project, and what roles did they play?	
School representatives: Community: NGOs: Engineers: Government: Others:	
How was the project initiated?	
How was the project financed?	
If any, what were the challenges involved in each stage of the project?	
Initial set up of the project and the team: Agreeing a suitable design: Constructing the design: Others:	

End of interview

Reconstruction:	NGO representative
Participant number: Position: Roles and responsibilities within the project:	
At what stage in the project is the current school construction?	
Timescale of the reconstruction project:	
When was the project initially agreed? When was the design confirmed? When did the construction work begin? If completed, when did construction work finish? How long after construction work finishing were children able to return to school?	
Quality of the reconstruction:	
On a scale of 1-10, how would you rate the quality and success of the reconstruction project? Has anything negatively affected the construction process?	
Design process:	
What materials and technologies have been used in the reconstruction? How much control over the design did you have, including layout and materials? If not you, who was the driver behind the selection of materials and technologies? Were there other considerations that were taken into account when choosing materials, such as costs or material shortages, and what impact did these have?	

If different from those used, what materials and technologies would have been preferable, if the barriers to implementing them weren't in place? When considering seismic resistance, how do these options compare against the implemented technologies? Did the head teacher and school representations have a say in the design of the new school and the facilities provided?
Labour:
How were the labourers selected for the reconstruction? E.g. local labourers, an established team brought with the NGO? How much training for the labourers was required? On a scale of 1-10, how would you rate the skill and proficiency of the labourers to construct to the design?
Were you involved in the provision of the temporary structures prior to the construction of the permanent school?
If yes, what structures were used, and were they earthquake resistant? If yes, how were these structures chosen? If yes, what the intended life span of these structures, and how did this compare to the length of time they were used? Were the temporary structures incorporated into the design of the permanent structure?

Organisational involvement:	NGO representative
Participant number: Position: Roles and responsibilities within the project:	
Which organisations and groups have been involved in the reconstruction project, and what roles did they play?	
School representatives: Community: NGOs: Engineers: Government: Others:	
How was the project initiated?	
How was the project financed?	
If any, what were the challenges involved in each stage of the project?	
Initial set up of the project and the team: Agreeing and approving a suitable design: Constructing the design: Others:	

End of interview

D.2. High-level interview schedule

School Reconstruction in Nepal: High-Level Interview
Purpose of the research:
This questionnaire is to be asked to representatives within organisations that are involved with school reconstruction in Nepal. The general purpose of this questionnaire is to establish the primary roles and objectives of each organisation, identifying types of construction used, selection of projects and how they fit within the wider school construction field. While some of the data collected may be used within published results, the primary objective is to provide observations which will help limit and direct the focus of later, more in-depth questionnaires, producing more quantifiable data. Any participant in this research is free to leave the study at any time, and is not required to answer any question they do not feel comfortable answering. The purpose of this questionnaire is not to validate the safety of any reconstruction projects. The interviewer is not qualified to assess the safety of any buildings, and will be unable to act on information regarding any potential safety issues raised.
Confidentiality:
This research is being conducted as part of PhD research conducted at Newcastle University, UK. All data and responses collected will be confidential and stored securely on university hard drives, only shared with the primary researcher and supervisors. Where data and responses will be used within publishable work, all responses will be kept anonymous.
Audio recording:
The audio of the interviews conducted may be recorded. The recordings will be stored securely on university hard drives. The recordings will be used to provide a full transcript of the interviews, to ensure that responses are recorded accurately. A second interpreter may also be used to verify translations, if there is confusion over answers provided.
Permission:
I, _________________________, as a representative of the NGO working in the field of school reconstruction, consent to take part in this research, and understand that all data provided will be used anonymously. I consent to an audio recording of the interview being taken. Signed:_________________________
I, _________________________, within my role as interpreter for the interviews conducted, agree to provide a full and accurate interpretation of all questions and answers provided. I consent to an audio recording of the interviews being made and used for the purposes of this research. Signed:__________________________
Contact details:
Name: Phone: Email: Work Address:

School Reconstruction	Organisational involvement
Participant number: Position: Organisation:	
Roles of the organisation:	
What role does this organisation play within school reconstruction in Nepal? When was this organisation established? If established prior to the 2015 earthquake, has the role and focus of the organisation changed due to the earthquake? If so, how? Details of links to any of the case study schools:	
Effects of the earthquake:	
How did the 2015 earthquake affect school infrastructure across Nepal? What do you see as challenges to successfully rebuilding schools in Nepal? How many schools are affected by these challenges?	
Reconstruction project details: (if involved with the design or construction aspects)	
What materials and technologies are used within your work? How are these materials and technologies selected for each project? In which locations do you work? How are these locations selected?	

In your opinion, how successful are this organisation's projects?
Reconstruction details: (if not directly involved in design or construction aspects)
Which materials and technologies does this organisation advise and recommend for reconstructing schools? Does this vary depending on the location of the schools? If so, in what ways? How are the locations of school reconstruction projects chosen? In your opinion, how successful is the current approach to school reconstruction in Nepal?
Co-ordination of reconstruction projects:
How is school reconstruction across Nepal co-ordinated? Where does this organisation fit within the wider structure of school reconstruction in Nepal? Are there organisations above or alongside you to which you must report? Are there organisations under this one that you co-ordinate?

End of interview

Appendix E:

Pilot study interview transcripts

Appendix E. Pilot study interview transcripts

E.1. High-level 1

School Reconstruction	**Organisational involvement**
Participant number: 1 Position: Social business developer and sales manager. Arranges the contracts and contact with the NGOs etc. Organisation: [NGO]	
1) Roles of the organisation:	
a) What role does this organisation play within school reconstruction in Nepal? Implementation and technical partners for I/NGOs for CSEB. Work with organisations (and sometimes local entrepreneurs who have funding and projects set up, but need the technical expertise. *"We exclusively work as implementation and technical partner for school rebuilds and any rebuilds for NGOs and INGOs, and sometimes local entrepreneurs, but local entrepreneurs are generally just for houses. So it's mostly for I/NGOs so they have already mostly assigned the working area, or they know someone or somehow have a village where they want to rebuild a school. They have the funding but they don't have the technical competence or knowledge or implementation, and that's where we have the engineers, the machines for earth bricks for production, and the technical know how. "* b) When was this organisation established? If established prior to the 2015 earthquake, has the role and focus of the organisation changed due to the earthquake? If so, how? July 2015. [NGO] with funding ended up helping rebuild houses for a marginalised community post-earthquake. Used bamboo, but very little take up so moved into CSEB P: *"July 2015".* I: *"So, post earthquake?".* P: *"Yeah. The work started immediately, and* [name]*, the founder's, existing companies, and then as soon as this was registered, we worked through the non-profit* [NGO]*."* I: *"and that was started as you'd been involved in work, did the bamboo construction come as part of the decision to make an organisation, or did that come as an entirely separate choice."* P: *"By some chance we found this village, and we felt like we needed to do something, it's ??? people, they used to be fishermen, but there's a lot of sand extraction and river things going on, so there's almost no fish left. So they were struggling before the earthquake, and now they didn't have houses and the NGO in Sweden had collected a lot of funding after the earthquake, and we wanted to use that to try and help somehow. And I guess as* [name] *has started multiple companies here with a social idea behind them, he saw the perfect opportunity to make a real impact. And we also felt like the more we worked, the more knowledge we gathered, and we also felt like, hey, we've done so many mistakes, we've found something that works with earth bricks. We're running out of funding but we have all these other organisations and we can help them not make all the mistakes, but just directly use the money for something that works, so instead of doing the fundraising and having our own small projects, the way we can have an impact is if we scale up, and we focus on the technical parts, and our partner I/NGO focuses on the funding and these things."* c) Details of links to any of the case study schools: Several, to be discussed at a later date.	
2) Effects of the earthquake:	
a) How did the 2015 earthquake affect school infrastructure across Nepal? Not sure of details. Damage to 600,000 houses in 31 districts, and complete/partial damage to many schools *"To be honest, my knowledge is not very accurate on this, I haven't seen so much data on this, I know 600000 houses were destroyed across 31 districts, of which 14 were deemed the most… But obviously*	

I know a lot of villages where we're working the school is either completely damaged, partially damaged, but I don't have any figures."

b) What do you see as challenges to successfully rebuilding schools in Nepal?

- Corruption/bureaucracy – government process not very transparent or quick. Officials and companies taking cuts of funding in the process, signing off approvals etc.
- Government process slow
- Topography – challenging in hilly areas
- Schools were poor to begin with pre-quake, already base line challenges
- Big demand on materials/skills due to scale of challenge and lots of work focussed on houses. Supply is limited and more expensive.
- Community approval/balancing expectations – schools want to get as much as they can from the reconstruction, big schools, more class rooms etc. but may not be feasible, or best use of resources

P: *"well if we start with the sad part, I would say there is a lot of corruption and bureaucracy around it. So I'm not the one working directly with getting permissions, but there's always the process with government, it's not very transparent or quick. For example, we have, I know I've spoken to some people and they were rebuilding schools, but the ministry of education thought they were rebuilding it too cheaply, so they wouldn't sign off on it, because on other projects, they were most probably, I guess, taking a cut, and that's why that school was more expensive. Otherwise, I guess, topography, especially in the hilly areas. Following the earthquake, I don't know if the school's infrastructure probably wasn't perfect before, and now with all the houses being rebuilt, there is a big supply gap in quality construction materials, so a lot of people are paying more for less quality materials than before the earthquake. There is some good reports on this supply gap, this is a major constraint on reconstruction."*

P: *"Permissions, the government, bureaucracy things, topography, and then of course, it's really poor to start with. So like, most villages couldn't afford to build to start with, and now they're struggling to rebuild their houses. And that's why, kind of, we found earth bricks, and we feel like in many of these places it's a really good technology to work with, because it doesn't do anything about the government bureaucracy, we have to wait for so long for the government approval and the approvals in different projects, but, it's cheaper, its earthquake resistant, and also we're empowering the locals in using local materials which means when the schools over, they can earn a living, rebuild their own houses, which increases the chance of them being able to afford school tuition fees, school uniforms, examination fees."*

"And then of course, compared to a western perspective, another thing that is very hard, and I don't blame them at all, I mean, you have to have the community's approval, and in any community they will try and get as many classrooms as possible, because depending on how many classrooms there are, the more teachers you can have, and the teachers want a whole classroom as their office. Whereas we think, there are only 50 kids here, do they really need 5 classrooms, can they do with 4? And we can use that 5th classroom funding for something much better. And then, you know, you have to meet half way somewhere there."

I: *"that would be something that's really interesting to look at, balancing those."*

P: *"yeah, because you'd think the number of teachers they have should be based on the number of students they have, not the number of classrooms, so you can't blame them for wanting for classrooms either."*

c) How many schools are affected by these challenges?

Unknown.

P: *"the hardest part as well, is, not just for schools, but in general, we feel we are the most committed to every project, almost. Which means that , someone could say 'you'll have to pay me some money otherwise I won't cooperate in this project, I need my cut', but we say 'we don't do that'. We risk getting all these problems in the project."*

P: *"at least for houses for example, if the government engineer that signs off on the houses to get the grant, he says 'I need my cut to sign off', then we say 'we can't do this', and then we tell the locals 'this guy don't want to sign off on this', then they are going to create hassle for this guy until* *he signs off, so there are these big additional challenges, that takes time and there is confusion going on."*

3) Reconstruction project details: (if involved with the design or construction aspects)

a) What materials and technologies are used within your work?
b) How are these materials and technologies selected for each project?
c) In which locations do you work?
d) How are these locations selected?
e) In your opinion, how successful are this organisation's projects?

4) Reconstruction details: (if not directly involved in design or construction aspects)

a) Which materials and technologies does this organisation advise and recommend for reconstructing schools?

CSEB – new to Nepal but successfully used in other countries. Very efficient technology in certain locations, want to make the most efficient in Nepal and roll out as wide as possible.
Also stone cutting – machinery to make cutting and dressing more efficient, for areas where all other technologies not feasible. Make the most out of the materials available. However, only provide infrastructure for this, not involved in the construction side of things.
P: *"Mainly earth bricks, that's the only thing we do construction in, and we do efficient stone cutting as well, but then we're not building anything in that stone.". (long pause, interruption)*
I: *'Is that something you're not constructing in yet?'*
P: *'We won't do construction in that, I don't think, because the thing with earth bricks is that it is new in Nepal, no one else knows how to build with it. Stone they know how to build with and the bottleneck is that there is not enough stone masons to do the cutting and the dressing. And the cutting and the dressing with an efficient machine is the easiest to make more efficient.'*
I: *'So that is just you putting in infrastructure?'*
P: *'Yeah, so instead of them standing like this every day, you make that 10 times more efficient and then they can actually focus on the construction part, which they already know. But you never know, our focus is not just reconstruction, long term strategy is to make earth bricks the most efficient and impacting construction material in Nepal, that is the safest, most affordable and sustainable to build with, and especially in the hilly areas. And it goes way beyond reconstruction. For example, you see on the maps here* [photos provided]*, we have tons of entrepreneurs and tons of NGOs working in different areas, but in the future we have double or triple this, and a lot of them are local entrepreneurs, and they have no chance of winning a Save the Children tender for rebuild, but we have, because we can do all the really detailed documentation, and auditory reports. And then we subcontract to the local entrepreneur, that gets the actual contract, we supervise, we do the quality assurance but it is the local people doing the actual work. And that way we can build schools efficiently that are not for reconstruction purposes, but construction, and that's how we help the local entrepreneurs to succeed as well.'*
I: *'so that's the longer term vision?'*
P: *'Yeah, now we still don't have…we have 50 production places of which more than half is INGOs, and they are more focused on building houses, helping the communities. But the entrepreneurs, if they get a school contract, which we have in a few cases, if they buy a machine and production training, they will regain that initial investment just in that first project, and then they can rebuild houses."*

b) Does this vary depending on the location of the schools? If so, in what ways?

CSEB good for dirt roads. On blacktop roads and semi-urban and urban areas, fired bricks are just as efficient, as transporting them and they won't get broken in transit, and although CSEB may still work out slightly cheaper, putting in the infrastructure and teaching the technology wouldn't provide enough savings to be considered worth it.
CSEB not ideal above ~3000m as curing the bricks is harder, and transporting the materials more challenging. That is where stone cutting machinery could be implemented, if there were plenty of stone available.
I: *'have you got this mapped where the areas you work are?'*

P: *'No, we only have it here. We have been thinking for a year to put up an interactive one on the webpage, but it hasn't happened yet.'*
I: '*I'm quite interested in getting an idea of the spatial variation of what is going on'*.
P: *'There definitely seems to be a lot of NGOs, you'll see that on HRRP, they have a map of where NGOs are working and not working. So for example in Gorkha there are tonnes of NGOs, but in some parts of Gorkha, which have no NGOs for some reason, and their whole focus is to more evenly distribute the help and make sure everyone gets some assistance.'*

c) How are the locations of school reconstruction projects chosen?

Generally [NGO] just come on board as a technical partner, so the project/location is set by the partner organisation. May turn down projects that they wouldn't be suitable for e.g. urban/high altitude.
I: *'so you were saying before the earth bricks are better in the hilly areas, or on dirt roads.*
P: *'Yeah, if you're on the black top roads, it is still cheaper, but the whole thing is that it needs to be a lot more cost-effective, because then you can regain your initial investment in one school rebuild, and even save money, even with the start-up cost of training and machine. Whereas if you're on the blacktop road, and the bricks don't break, then the difference is not so much, and you're not that troubled, going through the whole hassle. And that's what we see, the projects that we started on the black top roads, they are not so much more expensive to build with the fired bricks, so why should I build with this, whereas if it's 3-4hours up a dirt road, and they can't afford the fired brick ones, they are like 'this is just amazing, we can rebuild the house at half the cost, and it looks just like brick and it's really strong'*
I: *'and you get a lot more community take up from it?'*
P: *'yeah, and the entrepreneurs were very eager as they know that it is cheaper and easier, and they can sell these bricks.'*
I: '*choice of school projects/setting up these projects, process'*.
P: '*Sometimes we get a Facebook message, a teacher like 'Oh we need help, what can you do for us' and unfortunately we don't have unlimited resources, and we have to say 'usually we work with I/NGOs, if you can get one of them on board, they we can come on as technical partner and support you with training and build.' But generally its just I/NGOs, and they see us on Facebook, or google earth bricks, or [NGO] – ' lets talk to these guys and see what they do'. I guess for INGOs, they appreciate we are a local company, we are only registered here, but we have international management, and I guess that gives them more comfort that this is going to be handled on time, and professionally.'*
I: *'yeah, and an INGO has to have a local partner?"*
P: '*Exactly, and we're the local partner and the local company. The management is Swedish.'*
I: '*So they then have the project set up?'*
P: *'Yeah, and I don't actually know how they set them up, whether it's an NGO with someone that knew someone that knew someone that stumbled upon this village, where there was no school, where they took it upon themselves to fundraise. Whereas I guess Save the Children and the big ones, it's more like involved with the ministry of education and these are your schools or this is your district, or these are your VDCs and it is more regulated in that way.'*
I: '*are there times when I/NGOs will approach you and you'll say actually this isn't really within our remit?'*
P: *'Yeah, so we had a guy from* [town] *who was building on 4-5000m which was way too high for earth bricks, and that was before we started with the stone cutting, but that is what happened over the last year, and we've learnt more about earth bricks, and know that above 3000m it becomes very challenging because the production uses cement, and if it's less than 3 or 0 (degrees), then it stops the curing and the bricks aren't strong. So I would definitely say high altitude is not our strength and semi-urban and urban too, but then in between there, specifically on the dirt roads and in the hilly areas, that's where the earth bricks…but then with the stone cutting now, we'll be able to, not build a stone school yet, but be able to help make it more efficient.'*

d) In your opinion, how successful is the current approach to school reconstruction in Nepal?

Unknown.

Major focus is houses, so little data available regarding schools, but still lots of schools needing rebuilding.
P: '*I actually don't know. HRRP send out all these figures for house reconstruction all the time, so you always know, but I guess that's where the major focus is, because most families, they don't care about the schools so much unless they have a house. Honestly, I don't know the figures, I just know there are tonnes of schools to be rebuilt, and if they want help with that, then we are more than happy to join in. I'm not sure if there are good statistics on that either, I don't know if you've found anything. I know the HRRP are trying to make things more transparent for the house reconstruction'*
I: *'yeah so I think that's where the project originated, that there seems to be this black hole of information'*
P: *'Yeah, no one knows, people just stumble on schools and that's how they get rebuilt and then whichever school doesn't get stumbled upon doesn't get built.'*
I: *'and like you say, there is that kind of intermediate level between government and NGOs for housing, but we haven't found anybody or any data that matches what the government say is happening or wanting to happen, or what's happening on the ground, so that may be a challenge I start to focus on some more.'*

5) Co-ordination of reconstruction projects:

a) How is school reconstruction across Nepal co-ordinated?

Unknown. Generally badly – as opposed to housing which has the HRRP (Housing reconstruction programme?) overseeing the work and acting as a link between government and NGOs, there isn't a school equivalent. Generally a difference of opinion that the government is seen as not doing enough, but NGOs are seen to not be effective enough or working quick enough.
P: *'I actually don't know how much is co-ordinated. My guess is that it's very badly coordinated and that generally the INGOs think the government don't do anything, and the government think the NGOs don't understand and they just want to focus on one village, and that they need to help more places I guess.'*
P: *'Definitely need to speak with HRRP as this information gap for housing is what they focus on, and a lot of the experience they have there will be able to be compared to the schools, and they probably know a bit about the schools as well.'*

b) Where does this organisation fit within the wider structure of school reconstruction in Nepal?

Technical partner/implementation.
Good for joining with I/NGOs, particularly international who need a local partner to work with.
Leading organisation in CSEB. Good at visibility and communication.
Mostly now work with bigger NGOs rather than small where they started, but also working more with local entrepreneurs approaching directly with a set of funds (this may be construction or reconstruction.
P: *'we are the implementation part, we want to make that easier, and we are like the perfect for INGOs who don't have a strong presence here, because we have tight financial control, we send reports we send pictures, have good documentation, and actual good comprehensive contracts, what's included, what's not. A lot of the I/NGOs, they might be here, but they may not have a strong presence, they really appreciate that they can just sit back in the UK or somewhere, and they just get videos or pictures, and things are happening'*
P: *'That's where we see ourselves in the future as well, our focus is in general, right after the earthquake the small NGOS and the small INGOS they went ahead with the reconstruction process, it's been three months, it's time to get started, but the government were super slow, the big I/NGOs were slow because they don't want to work in the grey zone, they want to make sure we are following all the government guidelines else it's there neck on the line. Whereas the smaller I/NGOs don't care. We worked with the small ones in the beginning, and said, you know, let's not wait, let's get started. But now that the approval has come, the big ones are moving ahead and working with earth bricks as well. And in the future, the small ones work like this, we've working with many small I/NGOs and now we've started to work more and more with big ones. But also with more local entrepreneurs, who are wanting to invest directly. So I guess the future where we see ourselves is working to rebuild*

schools using those local entrepreneurs that we have all over the place already, and helping them to win tenders, looking at where are all I/NGOs working, looking up if you have any projects, instead of getting a company from Kathmandu, and importing materials from India, we'll work with local materials and local people. '

c) Are there organisations above or alongside you to which you must report?

Will speak to [NGO] lawyer for more in depth. Generally have to report to partners, and also provide monthly reports to ministry of education. Sometimes have to report to districts too. Both post project and in the approval process.

P: *'The best to reply on this would be [NGO], our lawyer. But you have to send monthly reports, to the ministry of education I think. And sometimes they have meetings so you have to go there every now and then and update them. Especially if your report wasn't comprehensive enough or missing information, you have to go there and tell them 'this is what's going on'. And also sometimes you have meetings in the districts. I don't exactly know the structure of it.*

And then the partners that were working with. Yeah, sometimes for the approvals, we take the approvals directly and we are directly responsible for all these meetings and things, sometimes its our partner NGO who does it and they are responsible for sending the report and go to all these meetings and things. '

d) Are there organisations under this one that you co-ordinate?

Responsible for coordinating projects on the ground ([NGO] has project leads who oversee this). They can provide more detail.

P: *'My responsibility is mostly on getting new partners on board, signing the contract, reporting to them, so I'm usually the first contact for them, especially when it's foreigners abroad or here, or people who visit every now and then. So for children of the mouth UK, we are starting a new project in Gorkha that you may visit next week, that* [NGO] *is the project lead on the site, doing the technical things, dealing with the contractors, the masons, the labourers, buying the materials. And I'm coordinating with him, I'm on an aggregate level where I'm higher up and reporting to the donors, making sure we're on timeline and these things. There is one project manager, and there are 4 project leaders. There are 2 lead engineers and 2 more project leads who lead smaller construction projects, who I could talk to.'*

E.2. High-level 2

School Reconstruction	Organisational involvement
Participant number: 2 Position: Engineer – been with the organisation one year, has acted as project lead on several projects, coordinated with partner NGOs and lead some training as well. 'civil engineer – I have been working here for about one year, and I have been project lead for some projects, and we have to coordinate with different NGOs as well, and we work as trainer also.' Organisation: [NGO]	
6) Roles of the organisation:	
d) What role does this organisation play within school reconstruction in Nepal? Technical partner. Work with I/NGOs for earthquake reconstruction. Teaching CSEB technology and providing the expertise in this area, implementing machinery, training and engineering. P: *'We serve as a technical partner, we are working with I/NGOs working with reconstruction and we serve them as a technical partner, we serve them and go to the villages and teach them how to make earth bricks for the reconstruction of schools and other buildings. We teach them how to make the houses, the schools, the buildings themselves. They can use the local materials, the local people, they can construct themselves, on their own.'* e) When was this organisation established? If established prior to the 2015 earthquake, has the role and focus of the organisation changed due to the earthquake? If so, how? Post-earthquake f) Details of links to any of the case study schools: Working on [school] – primary school in Rasuwa. Previously a stone building that suffered cracks in the eq. Brick training is complete, and construction work will commence after Tihar. P: *'[school], it is in Rasuwa. We have completed the brick production training, and very soon, after Tihar, we will start with this project and the excavation and all that.'*	
7) Effects of the earthquake:	
d) How did the 2015 earthquake affect school infrastructure across Nepal? P: *'Quite affected'. 'Some only suffered minor cracks, others major. First earthquake was a Saturday, so schools closed which minimised deaths. Different areas suffered different damage as construction methods/materials varied. The bigger schools and those in urban areas had more expensive, better construction so weren't as damaged.'* P: *'As I said earlier, the school [School] is in quite a remote area, with the rural area, and was constructed with stones as the construction material, and there were some major cracks. This is a primary school, and there were some major cracks, and we found some settlement of the soil, so we had to demolish all of the building, and now they have started the reconstruction.'* I: '*generally?*'. P: *'Talking about all of Nepal, it is quite affected, from very minor cracks to some very devastating major cracks, so like from place to place it is different, the scenario is really different. Some structures, not so much permanent structures have collapsed. In fact, the first earthquake which hit Nepal was on Saturday, which was the holiday for schools, so at least the students were safe from the earthquake as they were in their homes and not at school."* I: '*different areas?'* P: *'different areas use different kinds of construction material also, for the construction of school buildings and everything. So when it is more in a city area, they build some kind of, let's say, if there are a large number of students in the school, they have to build a more permanent structure, but like when we are quite away from the city area and the school is not even a secondary school, like a primary school or something, they built it with less cost and that's also, with that cost, they can't build earthquake-resilient structure.'*	

e) What do you see as challenges to successfully rebuilding schools in Nepal?

- Everything was already challenging pre-earthquake, which has just exacerbated it.
- Rural areas hit very bad. Transportation and roads poor, so need to transport material in batches rather than one go – takes longer, requires careful planning, costly.
- Skill shortage – trained people busy with houses, so lack of skills for schools

P: *'there are always challenges in Nepal, everywhere, from Kathmandu to rural areas, but when we are talking about some of the rural areas of Nepal which were really hit bad in the earthquake, the main challenge is transportation and the roads itself. Like we don't have much good roads, so we can transport all the goods and materials at once, we have to divide it and separate it into first batch, second batch and so one, so that is also quite challenging to transport all the materials. When we talk more about a school, or community centre or something we need to build themselves a skilled person, but after the earthquake, many people are building houses of their own, so they are very busy with their own residential houses. So for the school reconstruction, we also need the technical members as well as the non-technical members, supervision and scheduling.'*

I: '*different challenges in Kathmandu?'*

P: *'So, as I told, the challenges are everywhere, not just in rural areas, but also in Kathmandu. Like the Durbar High School. I think the school was more than 100 years ago, it was a very old school which was hit really bad with the earthquake, and still they are on the reconstruction process. So the problem was everywhere, inside the Kathmandu Valley as well as outside the Kathmandu Valley.'*

f) How many schools are affected by these challenges?

14 districts badly affected.

P: *'There definitely is. From the government side – when the earthquake came, it hit all 75 districts badly, but the government designated 14 districts as red alert, it was really hit very bad – many people died, many students died. So these 14 districts, if we talk about them, the devastation is quite high in these areas.'*

8) Reconstruction project details: (if involved with the design or construction aspects)

f) What materials and technologies are used within your work?

CSEB – sustainable material. And stone technology – efficient cutting and dressing machines. (don't oversee the construction but help with the implementation of the stone cutting machinery – allows areas with no access to other materials to make more effective use of the stone they do have available.

P: *'For now our main target is, from [NGO], we believe in the sustainable material, from what is there, so the soil is there, the earth is there, so our target is the earth brick. But for some areas, which are really very high altitude, it is not even like a hilly area, but when we go much higher, into the mountain areas, there are rocks, stones, and very hard ground, so now we are also focussing on the stone technology. So we have our stone cutting machine that we can set up, which works on single phase electricity, and we can cut the stone into pieces, we can dress the stone and use that as a construction material. From place to place it will differ. Based on altitude and based on the areas. Even some areas of hilly areas, it looks like a soil, or earth, but when we dig it, we can find very big rocks, so we have to find some kind of another construction material that works.'*

g) How are these materials and technologies selected for each project?

Available materials, suitable soil etc.

Altitude. CSEB not effective at higher altitude.

h) In which locations do you work?

55 VDCs within the 14 affected districts.

P: *'So those projects are basically, like, we are working with different I/NGOs, and entrepreneurs also, and they particularly choose the areas. As I told, there are the 14 districts in red alert zone, so we are now continuously working with…These districts are also divided into VDCs, and we are now working in 55 VDCs, and this is growing day by day.'*

i) How are these locations selected?

Working with I/NGOs – they choose the districts and the projects.

j) In your opinion, how successful are this organisation's projects?

Sustainable materials, allow communities to produce the bricks themselves. People are adopting the technologies/there is uptake outside of the individual projects.

P: *'as I told, there are many construction techniques all over, some are using the fired bricks, some are using the concrete blocks and other ones. So these bricks and stones, we are promoting as a sustainable material, and as people are also knowing they can produce the bricks of their own if they have the machine in their village, they can produce the bricks of their own. And people are really attached with this technology, more and more people are getting attached with this technology. Yes, it is really successful.'*

9) Reconstruction details: (if not directly involved in design or construction aspects)

e) Which materials and technologies does this organisation advise and recommend for reconstructing schools?
f) Does this vary depending on the location of the schools? If so, in what ways?
g) How are the locations of school reconstruction projects chosen?
h) In your opinion, how successful is the current approach to school reconstruction in Nepal?

10) Co-ordination of reconstruction projects:

e) How is school reconstruction across Nepal co-ordinated?

Schools with more students e.g. 500-1000 get government attention, they get involved in the reconstruction.
Funding provided by government and I/NGOs.
TLCs (temporary learning centres) were provided but these were very varied in construction. Government took the lead on some permanent/semi-permanent schools, but lots is done by I/NGOs.
P: *'well from that side, if we look to this, as I told earlier, where there are maximum number of students, for those areas, the government is also playing some direct role, where they are like, lets say, up to 500 students, almost 500-1000 students, the government plays direct role in that for the reconstruction, as a large number of students are directly affected. Later on, right after the earthquake, the government bodies and the NGOs they also donated some funds, and INGOs, they donated some funds, and they constructed, they call it the TLC, the temporary learning centre. The TLC was very different from place to place, in some they were very temporary structure, with bamboo and CTH sheet on the roof, the plaster with the cement and sand mortar, and they started the school, and it was a temporary structure the TLC. But now we are in the phase of reconstruction, so for permanent school or permanent building, or even a semi-permanent building, we are moving forward for that. For some school government took the lead and reconstructed it, but some are still in the process of reconstructing it, and I/NGOs are playing a really good role in that.'*

f) Where does this organisation fit within the wider structure of school reconstruction in Nepal?

Act as a technical partner, promoting the technology. Not just there to build one structure e.g. house/school and work on one isolated project and then leave, but to invest in spreading the technology e.g. using 'model houses'.
Not directly linked to schools or setting up the projects, just providing the technical expertise.
P: *'we definitely work as a technical partner, we are promoting the technology, it's not like, because when we are working with earth bricks, it's not like completing one house and returning back, because we are there to teach people, and promoting CSEB, we are working as a technical partner. What we believe is that when we go to a village, we can teach them when we go with a machine, and we can teach them how to make the bricks, and how to use the sustainable material, any sustainable material, and they can have the construction techniques. So the houses that collapse were also built by the local people, but they need to learn something more, so now later on, after the earthquake, say they building something that is really earthquake resilient structure, for that we have the interlocking bricks. So we work as a technical partner, we teach them for making bricks, the construction process, the maintenance of the machine, the roofing process, and everything.* Step *by step, not all at the same time, and we believe that we have made a model house, not only like a school or any other building they could make on their own. So yeah, we serve as a technical partner.'*

g) Are there organisations above or alongside you to which you must report?

Report to the NGOs/partners they are working with on a project.
Government – need to seek permission (national and local) to go ahead with projects (this is sometimes done by the partner NGO.)
Department of urban planning, DUDBC, Dept. of Education.

P: *'we have to work with the NGOs as well as the government also. Because when we are about to start work, it's not just like we got there and start the work, to start the work we need some kind of legal permission, some permission with the local body in the village that we are going to start the training. We need the permission of the department of urban planning, that is the technical part. We need to get approval from the DUDBC (department of buildings). If we talk about schools, we have to get special approval from the department of education. So there is proper coordination but NGOs who are funding, and proper coordination with the government who will Provide even a grant, and approval. And [NGO] serves as a technical partner.'*

h) Are there organisations under this one that you co-ordinate?

Community/local organisations. Generally work through one community contact/group, coordinating with them, but letting them take charge of organising masons, labour etc. as they have the local knowledge. Work through them to instigate training, get permission and engagement.

'it is like, definitely, if we are working for some area, some kind of project, in the village there is some kind of community, some local organisation, lets say, even some kind of clubs. We take the lead to start something, so we have to coordinate with them. So we train the masons, we are giving the training for something. We have to coordinate with the local body. We cannot approach every house door to door, 'you come for the training', so we have to choose someone who can really take the lead, collecting some people, sharing some information. Who are really technically sound also, so when we leave to another VDC or village, they can take the lead as a supervisor, and train others, and teach them how to rectify mistakes.'

I: '*local body who organise masons etc?'*

P: *'It is the local one, because when we go to some kind of village, we don't know who is the technical mason, and who is not the skilled masons, so we have to rely on them also. And later on in the course of training, we also provide information that is really helpful for them.'*

E.3. High-level 3

School Reconstruction	**Organisational involvement**
Participant number: 3 Position: Architect - drawings, designs, talking to community about designs, what kind of buildings they want Organisation: [NGO]	
11) Roles of the organisation:	
g) What role does this organisation play within school reconstruction in Nepal? Built a couple of schools. CSEB, stone cutting. CSEB has recently been approved. *"within school construction, we have built a couple of schools already, CSEB, we are focused on CSEB and stones right now, which is very recent. CSEB just got recently approved as a technology for construction in Nepal, and since then we have built a few schools."* h) When was this organisation established? If established prior to the 2015 earthquake, has the role and focus of the organisation changed due to the earthquake? If so, how? After earthquake *"right after the earthquake"* i) Details of links to any of the case study schools: See other [NGO] questions for details	
12) Effects of the earthquake:	
g) How did the 2015 earthquake affect school infrastructure across Nepal? 14 districts affected. A lot of schools *"not across Nepal, but there were 14 districts specifically affected by the earthquake, and there are, as per my knowledge, a lot of schools have had structural damage in"* h) What do you see as challenges to successfully rebuilding schools in Nepal? - Getting approvals is time consuming, lots of documents need to be produced. Approvals needed at local, district and national level (dep. Of education) - Budget *"Specifically for reconstruction, yes? The challenges is, getting approvals is time consuming process, we need to have a lot of documentation work, we have to do a lot of work with local level authorities, and then district level and then finally national level authorities. And there is the department of education here that is overlooking the entire process. So every school that is being rebuilt needs to be approved by the department of education. So those are the challenges. Sometimes the budget is a challenge also, the size of the classrooms and what we do depends on the budget.'* i) How many schools are affected by these challenges? A lot	
13) Reconstruction project details: (if involved with the design or construction aspects)	
k) What materials and technologies are used within your work? CSEB, stone cutting *"We haven't constructed in stone cutting, we have just recently started"* l) How are these materials and technologies selected for each project? Stone and fired bricks are widely used. CSEB is a new, locally appropriate material. Can be produced on site, by the owners/community – saves costs *"Stone and fired bricks are already abundant, and CSEB is an appropriate technology, for places, for rural areas where there isn't proper roads to take other construction materials, and where stone is also not there. So those places we can take the machine, and using local materials we can produce bricks on site. So that is one of the advantages, and also, the house owners, that is specifically for house owners, they can produce their own bricks, so that saves then a lot of cost, so they can contribute labour and save the money.'* m) In which locations do you work? Sindhupalchowk, Dhading, Gorkha, Nuwakot, Dolakha, Lalitpur, Kathmandu, and others	

"We are inSindhupalchowk, Dhading, Gorkha, Nuwakot, Dolakha, And there are some more I think, we are in Kathmandu and Lalitpur as well. Yes in Lalitpur we have a project, and in Kathmandu also"

n) How are these locations selected?

Needs based – where the reconstruction is required. Not higher altitudes – projects must be feasible.

P: *"Locations are mostly chosen by needs based – where reconstruction is required – it is those sites"*

I: *"Is that affected at all by the choices of materials you are using – so are there some areas where you say this just isn't suitable for what we are doing?"*

P: *"Yeah, so if we go a bit higher up, stone is very cheap and easily available, so people there would rather build with stone, so feasibility is a deciding factor as well, where CSEB is feasible, it's cheaper for people than other materials, there it is definitely worth it."*

o) In your opinion, how successful are this organisation's projects?

Quite successful in some places. Very few places not successful. Success – being able to transfer to local community so they carry on the work after [NGO] leave.

P: *"I think these projects run that we are doing are quite successful in some places. In some places very successful, and a few places I think they are not also"*

I: *"And what would you class as a successful project?"*

P: *"Our idea mostly is transferring this technology to local people, like we do the training and teach them how to build with CSEB, and like, once we leave the place, if they carry it on further, to build other houses, or other buildings in the village, with this material, this technology, then I would say it is a successful project."*

14) Reconstruction details: (if not directly involved in design or construction aspects)

i) Which materials and technologies does this organisation advise and recommend for reconstructing schools?

j) Does this vary depending on the location of the schools? If so, in what ways?

k) How are the locations of school reconstruction projects chosen?

l) In your opinion, how successful is the current approach to school reconstruction in Nepal?

15) Co-ordination of reconstruction projects:

i) How is school reconstruction across Nepal co-ordinated?

Dept of education and CLPIU. They have a list of schools to be rebuilt, and assign funds for most of these. Organisations have to report here

P: *"The department of education, the CLPIU, the Department of Education, they are controlling everything I think"*

I: *"So do they specify where people have to work, or do they, do you just have to report to them"*

P: *"They already have a list of schools that need to be rebuilt, and they, for most of the schools they also have fund segregated for rebuilding schools. So organisations that want to become involved in rebuilding schools have to deal with the local level formalities and also the department for education."*

j) Where does this organisation fit within the wider structure of school reconstruction in Nepal?

Implementation?

"That would not be a question for me I think – I am involved in the design side"

k) Are there organisations above or alongside you to which you must report?

NRA play some role

"National reconstruction authority is also playing some role, but our lawyer can tell you more about that."

l) Are there organisations under this one that you co-ordinate?

Local contractors – labour and construction.

P: *"usually, in some places we have local contractors we work with for schools, sometimes we're doing the construction, sometimes we hire people"*

I: *"So that's like the labour and the actual construction work?"*

P: *"Yeah"*

E.4. High-level 4

School Reconstruction	Organisational involvement
Participant number: 4 Position: Lawyer – legal compliance, permissions, fitting with NRA *"I deal with the legal compliance part of the organisation, I take information from government, agencies, working with them, and seeing what fits, what our organisation role fits within the NRA which is involved in reconstruction work"* Organisation: [NGO]	
16) Roles of the organisation:	
j) What role does this organisation play within school reconstruction in Nepal? Technical partner – local involvement, promote social reconstruction. Schools – learn to build this to then spread throughout community *"Mostly as technical partner, we work as technical partner with local involvement. What we promote is social involvement in school reconstruction. So that in school reconstruction, they can be involved in their own houses, private houses reconstruction also. School has been very important and crucial, because with school they learn how to build a safer place for their children, then, they can imitate for their household also."* k) When was this organisation established? If established prior to the 2015 earthquake, has the role and focus of the organisation changed due to the earthquake? If so, how? See other [NGO] responses l) Details of links to any of the case study schools: See other [NGO] responses	
17) Effects of the earthquake:	
j) How did the 2015 earthquake affect school infrastructure across Nepal? Detailed in PDNA education report. Before the earthquake schools were built with local materials, often to no specification, therefore lots of damage to these as unsuitable. Mud-mortar buildings were least to code, probably experienced most damage. Earthquake was on a Saturday so deaths much lower than could have been *"School has, everything has been recorded in PDNA of government, the National Planning Commission has prepared certain assessments of those things, so they are they general things that I know. But, according to my own experiences, I have to tell, in general, it was, before, school was built with locally available material, with stones, mud, mortar, and they did, in remote parts of Nepal, they didn't use to follow specific guidelines to reconstruct. So as per my visit, I have seen many of the schools ruined. But fortunately that day was Saturday, and schools were closed so no casualties of students were found – so that is general. Mostly mud mortar school buildings were the least following of the government code, had the vast majority of problems."* k) What do you see as challenges to successfully rebuilding schools in Nepal? Procedures and permissions – first go to local level, school management committee for approval. Then to ward/VDC office, then district, up to Dept. of education, CLPIU, NRA. Takes months – this is what slows the whole process down. *"First thing is all in the procedures of taking permissions, so according to my job basis – what problem I am facing is, first I have to go to local level school management committee and talk with them and prepare my notes, and then go to the ward level or VDC level staff, and talk with them, and convince them and get a recommendation letter. And again go to district and say please recommend for CLPIU and department of education at central level, and then again go to department of education. And they will ask for design drawings and again we have to go to CLPIU for design approvals, and it takes a lot of time for the approval of school designs, it takes months and months of going there. So after that, again we go to NRA, and they again send to department of education, and it Is like juggling. So I think, I don't know like, what government officials are thinking about it, but while we, as organisations want to speed up the reconstruction process of*	

schools, the only, always the backwards drawing part is permissions (?) and complying with the government, it is a very big challenge. "

l) How many schools are affected by these challenges?

18) Reconstruction project details: (if involved with the design or construction aspects)

p) What materials and technologies are used within your work?
q) How are these materials and technologies selected for each project?
r) In which locations do you work?
s) How are these locations selected?
t) In your opinion, how successful are this organisation's projects?

19) Reconstruction details: (if not directly involved in design or construction aspects)

m) Which materials and technologies does this organisation advise and recommend for reconstructing schools?

CSEB – locally available material at the core of [NGO]. Also some stone cutting. Want to enable communities to make most use of material available – most appropriate to BBB.

"CSEB bricks – actually we recommend locally available material to be at the core, because we are working in CSEB, as well as in stone cutting masonry, which means to the places where there is lots of stone, and people like stone we also teach them stone is equally resilient if you build in a certain way, following certain codes and all. So the more our concern is community involvement, that they can use locally available material. The most important promotion of our organisation is building back better with the locally available material and resources, so that they can work they can be comfortable with the reconstruction process."

n) Does this vary depending on the location of the schools? If so, in what ways?

Stone – Chum Valley in northern Nepal – low accessibility, snow, lots of stone available but no cement. Stone is perfect. Also people's preferences affect choice – cultural values etc.

"There are some places like Chum Valley, I think you have heard about – so Chum valley is in the very northern part of Nepal, with very very low accessible transportations. So there is snow clad mountains, and cold climate, there is lots of stone but no cement – that is the perfect place where we can go with the reconstruction of houses with stone masonry because traditionally also they have built with that. Sometimes it becomes necessary – of course people generally like to live in a concrete house, a beautiful house like in a city area, but we have some kind of cultural values in buildings also, so for example we have stone masonry has that kind of cultural value for us, especially in Himalayan part of Nepal. But keeping in mind transportation problem, and the cultural values, promoting stone is equally good over there if they can be built in a resilient way, so that is always a much better, a plus point for us."

o) How are the locations of school reconstruction projects chosen?

Mostly down to partners (at least initially). [NGO] now get a bit more scope to start projects or decide locations.

"Mostly like when we were growing up it was mostly due to the partners. When we were bigger, as we were growing bigger, we have a choice, like, if there is nice project, and partners want to help with that project, we are also ready with that. It is more like, our organisation is flexible, like according to situations and commitments we work on."

p) In your opinion, how successful is the current approach to school reconstruction in Nepal?

3 – 4 school projects done. People seem to like them, and there is good community feedback. The community accept them.

"We have I think built 3 or 4 schools for now. So they are quite beautiful, people seem to like them, local people seem to like them, according to their feedback, auditing. I find it quite fulfilling, I really feel good, while thinking ok, our organisation has been able to construct school for children who are really in need."

20) Co-ordination of reconstruction projects:

m) How is school reconstruction across Nepal co-ordinated?

Local level up to central level need to get approvals/recommendations. Individual schools there are school management committees. At government level, dept. of education, NRA etc. NGOs go with an approval/proposal and this is discussed.

P: *"Starting from a local level to central level"*
I: *"Who oversees all the school project, who has an awareness of what needs to be done and what is being done?"*
P: *"Mostly it is seen by school management committee, SMC regularly says that. However, monitoring and evaluation is done by central level, CLPIU and government agencies, it may be department of education, district education office, than social welfare council, national reconstruction authority, they also see the overall progress through monitoring and evaluation and time basis."*
I: *"So is anybody dictating what the NGOs are doing, or do the NGOs come in and say 'we're going to do this project, and then get approval'?"*
P: *"They don't dictate it – we go in with a proposal and they say, they hold a meeting and they study the proposal and ask lots of questions about feasibility, and then there needs to be, they ask for certain standards and proposals and everything, a cost estimation and cost analysis, so that is how it goes"*

n) Where does this organisation fit within the wider structure of school reconstruction in Nepal?

Technical partner and implementation.
"mostly a technical partner, and also an implementation partner sometimes."

o) Are there organisations above or alongside you to which you must report?

Monthly report to central level (dept of education, NRA, CLPIU, Social welfare council.) – seem to just be recording info, will release reports on numbers of schools, but little other detail. Local level less/no reporting as they see day to day progress. [NGO] submit the monthly reports, the team sit and put this together.
P: *"Approval, or are you asking about monthly reports? – Monthly reports – we need to submit monthly reports at the central level, we have not submitted that at the local level, as at local level they see day to day performance, however, central level requires that in written form and with pictures".*
I: *"And is that to department of education?"*
P: *"Department of education, CLPIU, NRA, and social welfare council"*
I: *"And what does that report involve, if they are not happy with progress would they intervene, or, do you just say how far you have got and they are recording that".*
P: *"Yeah, they are just recording – if they don't find anything problematic, they will not object, unless they see really very big problem – they do not go for minute details."*
I: *"Do you know what they do with that information?"*
P: *"No, I do not know about those things. They kind of record and I think later on they publish, but they only publish like, how many schools have been built, but they don't publish details like how they went through. They only, they have a huge information monthly report as a transect, but according, as per my knowledge, per my information, I have not got a detailed monthly report of all schools how they are built, school management committee involvement, we haven't got that publication".*
I: *"And is that you submitting the monthly report, or is that the engineers?*
P: *"together we do it"*
I: *"And is that also involving the partner NGOs or is it just* [NGO]*"*
P: *"Monthly report? Monthly report is just* [NGO]*."*

p) Are there organisations under this one that you co-ordinate?

Labour.
P: *"[NGO] oversee the work"*
I: *"And that's just on a specific project basis, like the labour?"*
P: *"Yes"*

E.5. High-level 5

School Reconstruction	**Organisational involvement**
Participant number: 5 Position: [Project] – DRR comms officer Organisation: [NGO]	

21) Roles of the organisation:

m) What role does this organisation play within school reconstruction in Nepal?

SESP – Mission statement available online. Building code implementation, earthquake preparedness, mason training, shake table demonstrations, technical assistance. 300 retrofitted schools pre-earthquake. Project to reconstruct 12 schools with [NGO].

P: *"overall….there's our mission statement. So the overall focus is earthquake preparedness. So this is our mission statement: to assist all communities in Nepal, to become earthquake safer by developing and implementing organised approaches to managing and minimising earthquake risks. So we have various programs. One of the programs is called [program name] in Nepal, so it's all about making safer housing and safe communities, so that's the building codes. We have another division which is called [team name], so there's also a focus on preparedness for different multi-hazards. And there's another program called [program name] which provides technical assistance to families to rebuild in different earthquake affected districts. So the whole focus comes down to earthquake and safer housing and preparedness."*

I: *"and the school program, is that just providing technical assistance and training?"*

P: *"Yes we do, the school program is such a program that this has been a pioneer program in the field of mason training, so the school program actually started mason training, and we also do a shake table demonstration. So that was also actually started from the school program. The table demonstration is an event where we go into a community and we build 2 model houses, and one we build safely and one is not safe, which we show by a dummy earthquake or something, and we show how one house is safe and one is not. That was pioneered by the school program as well, and it's a lot of earthquake preparedness and mason training, and technical assistance as well. So 300 schools have been retrofitted and* [NGO] *has provided technical assistance. Solely* [NGO] *has provided its 46 schools and the rest were supported by other organisations and* [NGO] *has a bit of an input here and there, so 300 schools in total."*

n) When was this organisation established? If established prior to the 2015 earthquake, has the role and focus of the organisation changed due to the earthquake? If so, how?

Before the earthquake the focus was on preparedness, raising awareness of potential for earthquake. After the earthquake people were aware of the need to prepare. Now the focus is on resilience.

No retrofitting after the earthquake, now on a project to construct 12 schools with [NGO] and [International aid organisation]. Focus on trying to construct accessible schools e.g., ramps for wheelchairs, tactile pavements for blind people.

P: *"Before the earthquake we did focus on earthquake preparedness, and as people had not seen an earthquake of this massive scale, we had to tell people that earthquakes can happen any time, that this can happen, and you need to stay prepared and be prepared and those sort of things need to be done largely but then after the earthquake, this kind of preparedness, we didn't have to go and say 'look, an earthquake', they already knew, they faced it. So the focus changed to capacity building and making communities resilient to hazards, so the focus changed like that. But the core remains the same, making communities safer from earthquakes."*

I: *"What kind of scale of retrofitting vs reconstruction do you do?"*

P: *"Yes reconstruction too, we were involved in a project funded by* [International aid organisation]*, a consortium between* [NGO], [NGO] *and* [International aid organisation] *in which*

12 schools were reconstructed after the earthquake, in 5 districts, and various things were kept in mind, like making it disabled friendly, so 5 of those schools are schools for the deaf, and also students were in a wheelchair, so buildings were made with a ramp, and railings, and what do you call them, which is each easier to walk (textured pavements). So those sort of aspects as well, so the new schools have incorporated those aspects as well."

I: *"would you say that you now mostly do reconstruction work is there's still lots of retrofitting work as well?"*

P: *"retrofitting, I think they go together"*

I: *"So quite balanced?"*

P: *"yeah, but I don't think we are/have been involved in a project of retrofitting after the earthquake, only new construction has been done after the earthquake, no retrofitting after the earthquake."*

Details of links to any of the case study schools:

[School] [School]

22) Effects of the earthquake:

m) How did the 2015 earthquake affect school infrastructure across Nepal?

See PDNA and Safer Society report for details and stats. 28000 govt schools 6000 private schools (should this be classrooms?!)

"I'm going to give you a link to PDNA as I'm going to get my data from there as well. … If you want data there are 28000 government schools in Nepal, and 6000 private schools, in total, across the whole of Nepal."

n) What do you see as challenges to successfully rebuilding schools in Nepal?

TLCS not built to last.
Management from upper levels
Lack of coordination
Very slow – still lots of TLCs even where weather is bad
Geography – transport in hilly areas
Lack of human resources, not enough capacity to cope with demand.
But – education doing better than cultural heritage and hospitals

P: *"Earlier I said, challenges basically management from the upper level I guess, it's going ok like, in terms of in comparison to the cultural heritage and hospitals, school reconstruction is actually quite better, in comparison. But there were some: management, a lack of coordination from the upper level, although they are doing their best. And another reason is, I mean, there, the biggest challenge is, it's happening but in a very slow pace. It's been 2 years since the earthquake, 2 and a half years, but still, the schools, you can see TLCs all over the place. For example, the school we went to today* [School] *is safe, but there are lots of other examples where schools are teaching their students in TLCs, like that, even where temperatures are worse than Kathmandu, hotter. Progress is a big challenge. And then there is also the challenge of geography. Lots of the earthquake affected districts are quite hilly, and transportation and road access is quite difficult, so geographical structures are quite difficult. And other one is lack of HR. the volume that is required for reconstruction does not meet current capacity, I think that is also a big challenge. So the TLCs were functional and made immediately but still it's continued, which should not be, there should be new structures. "*

I: *"Do you know if the TLCS are built optimistically to only last 1-2 years, or are they built to last 5-6 years?"*

P: *"2 years, they were built for 2 years"*

o) How many schools are affected by these challenges?

Schools closer to KTM, and in municipalities get most attention

I: *"So most of the schools in the affected districts would be affected by these challenges, especially the coordination?"*

P: *"Yes."*

I: *"Do you know if the bigger schools, and the high schools, like the one we saw today, get more help from the government that the smaller schools, or are there different patterns that emerge in how different schools are able to rebuild?"*
P: *"How they are approached by the government? I think personally, just personally, I think in terms of accessibility, if the school is not in too remote a location, is quite nearby to the municipality, their help arrives early for reconstruction, the government goes there faster. But then the schools that are more remote location and it is quite difficult to go there, they are the ones that are lacking major attention."*
P: "*But so far, I think we can't say now that schools that now, somehow, like initially the focus was to the near ones, but now schools in remote locations, even if it is not started, at least they have been offered, or they have been told 'ok, this organisation is going to help you or the government is going to help this one' this has been done, even if the work hasn't started."*

23) Reconstruction project details: (if involved with the design or construction aspects)

u) What materials and technologies are used within your work?

Brick, stone, rebar, sand, RC and masonry infill
"I consulted the engineer: brick stone rebar, cement, sand, aggregate, bamboo. And in terms of technology RC framed structure, masonry structure, steel frames and bamboo frames."

v) How are these materials and technologies selected for each project?

Local materials and resources, school need
P: *"local resources and location, and their needs."*
I: *"So like, a bigger school might be built differently?"*
P: *"Concrete, yes"*

w) In which locations do you work?

All over Nepal to raise awareness and go where the need is.
Started in Bhaktapur and stretched to others. (9 districts). The 12 school projects are in 5 districts
"We can say all over Nepal, but since [NGO] *started, in Kathmandu, and the first school we retrofitted back in 2000 was in Bhaktapur, So the focus was kind of more towards Kathmandu, Lalitpur and Bhaktapur. But then as we went along, it depends on the project, and depends which project has selected which districts. So earlier I gave you the example of the project with* [NGO]*, so it had 5 districts, and the project with* [NGO] *had 9 districts, so where awareness was needed, a particular district for example, there was no earthquake in the western part of the country, but then they do need awareness, and for the awareness types of project, such districts were selected. For reconstruction, the districts that were affected were selected. So the selection depends on which sort of program it is. And we have also worked in a very remote district of Humla, where preparedness was done, the software component was done in that district as well."*

x) How are these locations selected?

y) In your opinion, how successful are this organisation's projects?

Very successful – NSET have been making people very aware. All retrofitted schools withstood earthquake
"Very successful I think, it's encouraging, because [NGO] *has been making people aware about earthquakes, even before the 2015 earthquake, and retrofitting. Like now, more agencies, and more people and schools are aware of retrofitting, but we have been doing it when other people had not noticed it, so quite successful."*

24) Reconstruction details: (if not directly involved in design or construction aspects)

q) Which materials and technologies does this organisation advise and recommend for reconstructing schools?

r) Does this vary depending on the location of the schools? If so, in what ways?

s) How are the locations of school reconstruction projects chosen?

t) In your opinion, how successful is the current approach to school reconstruction in Nepal?

25) Co-ordination of reconstruction projects:

q) How is school reconstruction across Nepal co-ordinated?

Dept of education/ministry of education
Funding agencies
CLPIU, DLPIUs for education, District education offices
NRA oversee everything

P: *"The management here and the government, basically our affiliation as school department is mostly with the department of education, and ministry of education, and the director of the school program, based on their discussions, projects are chosen. And the funding agencies as well. And now there is department called Central Level Project Implementation Unit, and there is different District Level Project Implementation Units as well, the DLPIU Education is also an important government body to have discussions regarding school programs. Previously it used to be District Education Office of that particular district. While they are still active, but with this whole restructuring thing, we might be, the DEO might be a little bit inactive, while the DLPIU would be more active in terms of school reconstruction."*

I: *"So, would it be, in terms of knowing what schools need to be rebuilt, would that be a central thing, or a district thing, do they have a list of all the schools that need to be reconstructed?"*

P: *"So for example, we have a project here that we are doing in Nuwakot, so that project required a school to reconstruct, on not such a large scale, and when we consulted the DEO, they gave us a list of these 100 schools are going to be reconstructed by ADB, and this many by JICA, and these are the remaining schools that are left, and this is an example of how it is done, and then we had to look into the schools that were remaining and which we could support."*

I: *"So would you then apply and basically say we can help these particular schools?"*

P: *"Consulting with the DLPIU and making sure they were ok with us to build a school there. And there is the National Reconstruction Agency"*

I: *"And what role do they play?"*

P: *"They, when it comes to reconstruction, everything falls under them"*

r) Where does this organisation fit within the wider structure of school reconstruction in Nepal?

Technical assistance – develop designs and provide information.
[NGO] engineers on site, supervising, training masons

P: *"So our role mainly is technical assistance, so what we do is develop designs and provide information and those sort of things"*

I: *"So if you came onto a project, you wouldn't be involved in the reconstruction side of things, but more assisting, directing what work should be taking place?"*

P: *"Yes, but we would be there during the construction work. So I will give you an example, with the project that was reconstructing 12 schools, we had* [NGO] *engineers on site, and they supervised the masons and contractors there"*

s) Are there organisations above or alongside you to which you must report?

Funding agencies, government (DOE, DEO, CLPIU), not NRA

P: *"The funding agency and the government"*

I: *"so would that be the DOE, or NRA?"*

P: *"We need to report to the DOE, MOE, DEO, DLPIU Education. We do not need to report directly to NRA"*

I: *"So would it be the government who feeds this back to the NRA?"*

P: *"Yes"*

t) Are there organisations under this one that you co-ordinate?

SMC report to [NGO]. Coordinate contractors.
Coordinate with local community

P: *"We supervise the SMC, so if we are assigned to reconstruct, we talk with the school, just like in* [School]*, they supervise the SMC, and then talk to the school, and if the SMC is doing something then we have….we can't say under, but…..so they come to us, SMC report to us, and then we report to the funding agency, and the contractor, so the contractor reports to us, and then we coordinate with the local government, the DLPIU, the district. "*

I: *"So looking at, clearly there was a move to reconstruction, were you able to apply the lessons that you learnt during your retrofitting work to how you did your reconstruction projects, or are they quite different in approaches?"*
P: *"This question I think you need to ask the engineer, he has a better idea"*

E.6. Case-specific 1

Details of the school:
Location:
Distance from Kathmandu (miles): Within Kathmandu Valley (~10km when searching from 'Kathmandu' (near Durbar Marg) on google maps) *'I think, it is, 300m' – 'because this is in the municipality itself'. 'This is inside Kathmandu'*
Distance from Kathmandu (time): journey ~1.5 hr from [Kathmandu NGO office]
Accessibility: Difficult for building materials. All on 'proper' roads even though poor quality *'It is very difficult to take those kind of things (building materials), because sometimes we didn't get those things, and sometimes we didn't get vehicles and sometimes we didn't get man power, and we get trouble at that time, but we did that.'*
Location of school within community: Central – children all come from very close, less than 0.5km *'some childrens are coming far from here, about 300 or 400m far from here'.*
People:
Age range of pupils: Class 2 – 10 (Plus 11 and 12 from this year). *'Class 2 – 10, and we are launching class 11 and 12 this year)'*
Number of pupils: ~500
Number of staff: 25
Facilities: (Prior to the earthquake)
Number of buildings: 5 buildings (1 had been retrofitted) *'Before the earthquake, here there is 1, 2, 3, and 4, and 5 – 5 buildings'*
Number of classrooms: 17
Number of storeys: 2 storeys. Destroyed building was 1 storey
Toilets: boys and girls blocks 2 blocks of toilets, boys and girls. Boys – 2 and open. Girls – 2.
Assembly spaces: another building in the school with a hall Yes, we have a big hall under there, we have a new building there, and there is the big hall, there is the step, and we are conducting our programme there. I: *'And is that before the earthquake?'* P: '*Before – 2 storey, and under there is 1 hall.'* P: *'There is another building, an old one, like an amphitheatre, well not exactly'* P: '*Inside the school'*
Outside facilities:
Other facilities: (e.g. staffroom) Science lab, hall, library (not used/effective) *'In here we have so many facilities – science lab, another hall is here, ???, but we don't have effective library. We have a library but it is not used – it is not facilitated'*

Impacts of the Earthquake:	**School representative**
Participant number: 4 Position: Acting head teacher Roles and responsibilities within the project:	
1) School damage due to the earthquake:	
a) How many buildings were no longer usable?	

1 destroyed

P: *'1 building is destroyed, and next building is half destroyed – cracked. And that is the repaired. And the others are all fine.'*

I: *'And the retrofitted building was that damaged or was that fine?'*

P: *'Here we made new building, and next we repaired. And there is not any cracks in retrofitting'*

b) How many buildings were damaged but still usable?

1 damaged and now repaired. Retrofitted was fine

2) Disruption to teaching:

a) When was the initial disruption?

April 25

'This one is first (earthquake)'

b) Did the school have to shut temporarily? Was that immediately after the initial disruption or was there a delay?

Government closed the school

'Yes – government give whole day at that time, and we closed at that time'.

c) If any temporary buildings were provided, when were these put in place?

1 TLC

d) When were children able to return to school?

~1 month. Government had stated 33 days, but school was back running after 17 just opened by the time of the May 12. Was then closed 2-4 days after May 12.

P: *'I month, 33 days. Here 17 days, first earthquake – the government give 33 days, but here, we run our classes just 17 days, we hold our class just 17 days.*

P: *'When the may earthquake struck they had already resumed their classes, on the Wednesday the classes were running'.*

I: *'Did you stay open after the May earthquake?'*

P: *'We close 2 or 4 days and then we again start'*

3) Temporary buildings:

a) Who was responsible for and involved in the provision of any temporary buildings?

[NGO] and [INGO]. ([INGO] provided toys, focus on playing to deal with earthquake).

'We make a TLC – [NGO] and [INGO]*, some organisations. Rather than teaching, the main focus after was playing with the toys.'*

b) What temporary buildings were provided?

bamboo

c) If any, how were these temporary buildings selected?

d) How long did you have to remain in the temporary buildings?

Until reconstruction finished

'Before this new building, we stayed there'.

e) On a scale of 1-10, with 1 being not at all suitable, and 10 being fully functional, how suitable were the temporary buildings?

Was difficult – problem of rain and sun etc. – weren't ideal

'We had very difficulties in TLC – sometimes raining sometimes sun shining, at that time we found very difficult. When we got the new building we were very happy.'

f) How long were you willing to remain in the temporary buildings?

4) Are there any other hazards that effect school buildings and facilities?

No

Reconstruction:	**School representative**
Participant number: See above Position: See above	

Roles and responsibilities within the project: See above
1) At what stage do you think the current school reconstruction project is at?
Finished
2) Reconstruction project timescale:
a) When was the project initially agreed? 1 year after earthquake (TLC 10 months?) *'After 1 year when earthquake happened''TLC was run for 10 months'* b) When was the design confirmed? 2-3 months after agreement *'That takes 2 or 3 months, they search the place and they are tryig to make the new building where it is suitable, they are trying – it takes 3 months'* c) When did the construction work begin? 3 months after agreement (i.e. when design complete) d) If completed, when did construction work finish? 3 months ago (August 2017) *'This was finished three months before, ago'* ****END OF RECORDING – Run out of battery**** e) How long after construction work finishing were children able to return to school? Straight away
3) Has anything negatively affected the construction process?
No problem….. Transportation of materials was hard but easy to solve SMC helped Easy to make
4) School design:
a) How well do you feel the engineer/NGO engaged with you during the reconstruction process? Discussed lots with the engineer and also used a local engineer b) Did the school have any say in the overall design of the new school and the facilities provided? yes c) On a scale of 1-10, how safe do you feel in the new school buildings? Very safe. 9. Community were really impressed! d) Was there anything that was not included in the school reconstruction that you would have wanted? Were there reasons these were not possible? Wanted the stairs behind the building but had to go at the side because of the private house and arguments over land/availability of space. Wanted new toilets in the building which wasn't possible. Wanted to put in a new compound wall to create a better environment, but this wasn't done.

Organisational involvement:	**School representative**
Participant number: See above Position: See above Roles and responsibilities within the project: See above	
1) Which organisations and groups have been involved in the reconstruction project, and what roles did they play?	
a) School representatives: Management by SMC, mostly led by the headteacher. School signed off on the extensions of time due to delays. (due to materials, labour not showing and monsoon)	

b) Community: Workers were both local and from far away. Also employed a local engineer as well as the [NGO] engineer, but no others. Parents involved in discussion and some work – some were given mason training. c) NGOs: [NGO] – mason training, monitoring work. d) Engineers: Local and [NGO] – design work and initially signing off work e) Government: Supervising, giving advice, visiting. [International aid organisation] provided funding. DEO visited twice, [International aid organisation] visited 3 times. f) Others: n/a
2) How was the project initiated?
DEO – proposed after they visited the school. Part of 12 [NGO] schools project, reconstruction group – the only one in KTM.
3) How was the project financed?
[International aid organisation]
4) If any, what were the challenges involved in each stage of the project?
a) Initial set up of the project and the team: Lots of problems. Lots of visits to NGOs. Disputes. Choosing contractors – first wasn't good (SMC chose) – they stayed 1 month and then left, so had to find new contractors b) Agreeing a suitable design: Stairs – wanted to put stairs behind building but land wasn't available so they are at the side c) Constructing the design: Wanted the building in a different place, further back on the site. But the ground wasn't suitable d) Others: n/a

E.7. Case-specific 2

'They said we were going to do retrofitting, and when we started taking the plaster off the building, a lot of community people, so called engineers also, came to us saying [school] has a lot of money, look they are destroying their school, they are taking the plaster off. And it took 1.5 months to take the plaster off, and when the process started they started putting pillars and stuff, and then the community people also came around and said actually it looks like a good thing to do.
Details of the school:
Location:
Distance from Kathmandu (miles): Within Kathmandu – Lalitpur municipality [ward]
Distance from Kathmandu (time): N/A
Accessibility: Easy
Location of school within community: n/a
People:
Age range of pupils All – ECD to class 12 (20 classes, some years are split into a and b)
Number of pupils: 1100
Number of staff: 54
Facilities: (Prior to the earthquake)
Number of buildings: 5
Number of classrooms: 45
Number of storeys: Mostly 2, 1 building has 3. 'district education office disagreed, they had requested for a 3 storey, but the DEO only gave permission for a 2 storey'
Toilets: 1 block (male and female sections)
Assembly spaces: No (one large space on roof used for events, festival celebrations etc.) 'we don't have any halls, but we have space on the roof, to hold celebrations…'
Outside facilities: Courtyard/yard
Other facilities: (e.g. staffroom) Science and computer labs, library, staff room, principal room, vice principal office, accounts section

Impacts of the Earthquake:	**School representative**
Participant number: 3 Position: Adminstrator Roles and responsibilities within the project:	

5) School damage due to the earthquake:
c) How many buildings were no longer usable? 1 building and 1 toilet block, and damage to the compound walls *'That (1 building) and the toilet also needs to be constructed a bit'* d) How many buildings were damaged but still usable? n/a (other buildings had been retrofitted or recently constructed using ER features). (Some small cracks in the plaster work but assessed as safe) *'so the walls – the compound walls – they were all destroyed but were reconstructed'*
6) Disruption to teaching:
e) When was the initial disruption? Straight away (April 25) f) Did the school have to shut temporarily? Was that immediately after the initial disruption or was there a delay? Straight away – as most of the building was undamaged, the community felt the school was a safe place to be, so many of the community came to stay at the school. Some stayed in the classrooms and some camped in the courtyard, cooking and sleeping at the school. After about a week the people in the classrooms left for teaching to begin again (although those in the courtyard could stay). The school was just about to reopen when the May 12 earthquake hit and again the community sheltered at the school. Took 15 days to reopen after this. I: *'When the community came and stayed – how long did that last for, how long did they stay?'* P: *'So we had 2 earthquakes right, one was the 25th, so people came and stayed for about a week, even the rooms were occupied, and when they said 'ok, so now we are going to open the school' the people who were occupying the rooms left, but the ones who were outside in tents, they stayed. And as they were preparing to reopen the school, another earthquake came, on May 12th, so then again it was the same story. And then they finally opened the school on after 15 days (after May 12th).'* g) If any temporary buildings were provided, when were these put in place? TLC for the 1 destroyed building, with 4 rooms for class 1a and b and 2a and b. Built 15-20 days after May 12 quake. P: *'4 rooms, class 1a and b, 2 a and b (in the TLC)' 'Ok, so the classrooms that were here, they were used after the reopening of the school. Only that building's (damaged one) classes were held there, in the TLC'* I: *'When was the TLC built?'* P: *'So, 15 or 20 days after they restarted school, after May 12th earthquake'* h) When were children able to return to school? May 27
7) Temporary buildings:
g) Who was responsible for and involved in the provision of any temporary buildings? [INGO] and a local NGO. h) What temporary buildings were provided? 1 i) If any, how were these temporary buildings selected? Bamboo and tarp – mutual discussion but standard choice for TLC construction P: *'Bamboo'* I: *'and is that just what [INGO] said to build?'* P: *'Mutual discussion – when they say TLC, they immediately, automatically understood that it's going to be bamboo'* j) How long did you have to remain in the temporary buildings? 1 year – it got too hot to use and the students complained so they had to stop using it. They ended up merging classes rather than using that space. P: *'1 year – students started complaining so they merged 2 classes into one'* I: *'so if the weather wasn't an issue, would they still be using it?'* P: *'Yes'*

k) On a scale of 1-10, with 1 being not at all suitable, and 10 being fully functional, how suitable were the temporary buildings? Unsuitable during hot weather – prevented use! l) How long were you willing to remain in the temporary buildings? If weather hadn't been an issue would still be using it.
8) Are there any other hazards that effect school buildings and facilities?
n/a *'no'*

Reconstruction:	**School representative**
Participant number: See above Position: See above Roles and responsibilities within the project: See above	
5) At what stage do you think the current school reconstruction project is at?	
Retrofit: 1st phase 6 years ago (2011, 2nd phase 2012, 3rd phase 2013 (2 years before earthquake). 7-8 months after the earthquake the stairs were added. Also a new build before the earthquake. P: *'1st phase – 6 years ago, 2nd phase 5 years ago, 3rd phase, 2 years before the earthquake. The building 4 years ago, and the stairs immediately after the earthquake (7-8 months after), so end of 2015.'* I: *'So was the new building built at the same time as the last retrofit?'* P: *'This was built before they were retrofitted'* Reconstruction: Project agreed (mid October 2017) – demolition will begin soon.	
6) Reconstruction project timescale:	
f) When was the project initially agreed? Reconstruction – mid October 2017 g) When was the design confirmed? h) When did the construction work begin? Retrofitting – trying to coincide work with holidays when children weren't in school. Other times children had to move classrooms. i) If completed, when did construction work finish? Retrofitting – each phase took 7-8 months to complete. I: *'How long did the retrofitting take, how long was each phase?'* P: *'7-8 months, for each building'* j) How long after construction work finishing were children able to return to school? I: *'and did the classes have to move during that time (retrofitting), or did they have to move'* P: *'other places, so they moved them to other places, to other classes, and then after the retrofitting, they started new school year, and then they started school. It's like certain 2 or 3 months, it was when the school year had ended, so those 2 or 3 months were saved'*	
7) Has anything negatively affected the construction process?	
Retrofit – everything fine *'everything went smoothly'*	
8) School design:	
e) How well do you feel the engineer/NGO engaged with you during the reconstruction process? Retrofit - Followed the drawing	

'So whatever was in the map, like 4.75mm, 12mm or whatever, whatever the engineer said, we followed that, and nobody questioned, even we didn't question, we just followed whatever was written, according to the map (drawing)'

f) Did the school have any say in the overall design of the new school and the facilities provided?

n/a

g) On a scale of 1-10, how safe do you feel in the new school buildings?

Retrofit – 10 – all retrofitted and new build before earthquake survived well (some minor cracks to the plaster, but mostly undamaged.

h) Was there anything that was not included in the school reconstruction that you would have wanted? Were there reasons these were not possible?

n/a

Reconstruction:
The un-retrofitted building was damaged in the earthquake so isn't being used (hence TLC). It has just been agreed (October 2017) to reconstruct it – demolition will begin soon (November/December time).
Will be used for classrooms
DEO (Lalitpur) initiated. School will pay for demolition and DEO will pay for reconstruction. DEO had put out a notice, schools then applied and were selected based on their application.
Will be constructed similar to the new build before the earthquake
Use local contractors.
I: *'And what is the plan for the new building?'*
P: *'Classrooms'*
I: *'So who is involved in doing the work for that?'*
P: *'DEO – Lalitpur, so the demolition cost is bared by the school, but the construction cost is bared by the DEO'*
I: *'And when was it agreed that that building would be reconstructed?'*
P: *'15 or 20 days ago'*
I: *'And when will the work start?'*
P: *'so the demolition will be completed in a month, and then the engineer will come and take measurements and then the construction will start'*
I: *'And do you know how the new building will be reconstructed, will it be similar to the one built before the earthquake?'*
P: *'Yes similar to that one'*
I: *'And again, that will be local contractors doing the work?'*
P: *'Yes'*
I: *'To get the reconstruction, did you have to approach the DEO, or did they specify you as it was needed?'*
P: *'So the DEO had put out a notice saying we are building this type of building, and then the schools had to apply, and then they selected the schools based on the need and the applications they received.'*

E.8. Case-specific 3

Details of the school:
Location:
Distance from Kathmandu (miles): Unknown
Distance from Kathmandu (time): 6hr by bike, 8-9 by car
Accessibility: No public vehicles available up to the school, has to be by personal bike or car. Bus station 1.5hr walk *'It's not actually, there is no public vehicle access, when the bus station from the school is 1.5 hours walk. Apart from our private vehicles and bikes if we take, there are no public vehicles on that location, so we have to walk if we don't have vehicles and so on.'*
Location of school within community: Centre of village [village] – existing school damaged *'It is in the centre of the village, called [village]. Because [ward] is a ward of the municipality, rural municipality , it's a ward, and in [ward] there is a village called [village]. In the centre of [village] it's located. It already had an existing structure before earthquake and all the things were damaged, right now they are studying in TLC'*
People:
Age range of pupils: Primary – class 1-5, and ecd (extra-curricular department)
Number of pupils: 25
Number of staff: 8-10
Facilities: (Prior to the earthquake)
Number of buildings: 4 blocks (1 office, 3 classroom blocks), and toilet block *'There was 3 blocks actually, including toilets there was 4 blocks. 1 was office room block, 1 was 2 classrooms and 1 was 3 classrooms. Actually 2, 2, and 1, there were 5 blocks including toilets, 2, 2, and 1 classrooms and 1 office. In classrooms in total it was 6 actually, including ecd. (ECD is actually the government has implied extra-curricular, for the small, for the primary before starting the school, like the kindergarten type thing.'*
Number of classrooms: 6 inc. ecd See above
Number of storeys: All 1 storey *'All 1 storey'*
Toilets: 1 toilet block (3 toilets: 1 male, 1 female, 1 staff) *'1 toilet block, 3 toilets, 1 for ladies, 1 for gents and 1 for staff'*
Assembly spaces: Outside space *'Yeah, inside the compound there was around 1000sqft, more maybe'*
Outside facilities: Compound of 1000sqft (maybe more), but no land other than that – land was provided by ward office (See above)

'The school didn't have any land, in the name of school. They are using, we are bulding where the previous school existed, and the land is owned, provided by the local ward office for the school, but there is no proper land in the name of the school itself'

Other facilities: (e.g. staffroom)
1 office, no staffroom

Impacts of the Earthquake:	**School representative**

Participant number:
Position:
Roles and responsibilities within the project:

9) School damage due to the earthquake:

e) How many buildings were no longer usable?

2 completely collapsed, 2 damaged and unusable

'1 was completely collapsed, 1 was damaged but not collapsed – completely damaged but not collapsed. 1 was completely collapsed, and 2 blocks were completely collapsed, and 2 blocks were damaged.'

f) How many buildings were damaged but still usable?

10) Disruption to teaching:

i) When was the initial disruption?
j) Did the school have to shut temporarily? Was that immediately after the initial disruption or was there a delay?
k) If any temporary buildings were provided, when were these put in place?
l) When were children able to return to school?

11) Temporary buildings:

m) Who was responsible for and involved in the provision of any temporary buildings?
n) What temporary buildings were provided?
o) If any, how were these temporary buildings selected?
p) How long did you have to remain in the temporary buildings?
q) On a scale of 1-10, with 1 being not at all suitable, and 10 being fully functional, how suitable were the temporary buildings?
r) How long were you willing to remain in the temporary buildings?

12) Are there any other hazards that effect school buildings and facilities?

Reconstruction:	**Engineer**

Participant number:
2
Position:
Engineer and project leader
Roles and responsibilities within the project:
Look after budget, quality control of work, train locals in CSEB, All construction aspects.

P: *'Me personally, I have to look over the financial and management of the school construction, within the whole budget of the construction. I have to manage the construction with the quality control as well as the budgeting and train the locals over there with the CSEB as well. Really its all the whole construction until we hand it over to the school, completion of the school and then handing over to the principal.'*

I: *'And in terms of design, have you done a specific design for this school, or is it a set design that was already in place?'*

P: *'It was a design for the school that we made in Dhading, and it was a similar area, and same design was used in [ward], but we still have to pass the design for that school, but we are using the same design that has already passed.'*
1) At what stage in the project is the current school construction?
Dismantling work and excavation started. Layout was done but will need to be redone after the festivals as strings have been moved. *'Right now, the dismantling work has been completed and the excavation work has started. But due to the site problems right now, and due to the festival, we have now stopped, halted. But I am again going over there, I have to again do the layouts. They had started the excavations, but with the strings and all, they have moved and I have to do it again. Layout has been done, that's all I think'*
2) Timescale of the reconstruction project:
a) When was the project initially agreed? Start of October (discussed beforehand in September, but contract signed October) P: *'It was last month I guess, yeah, last month, started, signed in the start of October, and in February we have to hand over – all works have to be completed, everything by February. With 2 blocks, 2 rooms and 3 rooms.'* I: *'So the start of October, that was the project landing with* [NGO]*, saying we want to start this?'* P: '*Yeah, the contract was signed at that time, in the middle of Dashain and Tihar, and at that time we had already started the project, so because of the contract signed, we still have 5 months.'* b) When was the design confirmed? September/October – design was reused from another project, so came on when contract was signed. *'It was confirmed in October I guess, maybe before, in September I guess – I think we should say October itself, because I think at that time I know at contract it was signed.'* c) When did the construction work begin? October 15th *'October 15th I guess'* d) If completed, when did construction work finish? (expected finish February) e) How long after construction work finishing were children able to return to school? -
3) Quality of the reconstruction:
a) On a scale of 1-10, how would you rate the quality and success of the reconstruction project? Unfinished/work not commenced b) Has anything negatively affected the construction process? Issues with commitment to project – [NGO] got [NGO] and school to sign different things, so expectations were different – school had been promised more buildings/facilities – was challenging to balance expectations of the school, within the budget of the project. *'Yeah, the problem is with the budget, and the contract signed. We have like issues with the, first commitment with the client, committing something to the people over there, and they signed something different with us, and then going over there they were asking 'this has been told to us', and the social issues I guess. Now we are just building 5 classrooms, there is no provision for ECD, and the problem is, from the client side, 1 and 2 is supposed to be combined in one class, because of the number of students, and it's actually reasonable as well, but the local want different classrooms, because they want more and more I guess. But at least, those issues have been sorted last time I went out I think'* Challenge – water accessibility – see Organisational Involvement, school representatives involvement below
4) Design process:
a) What materials and technologies have been used in the reconstruction? CSEB. Masonry foundations (like on [NGO project]). Lightweight truss roof.

P: *'CSEB, earth bricks'*
I: *'And then the same foundations as in* [NGO]*?'*
P: *'Yeah, masonry structure'*
I: *'What kind of roof will it have?'*
P: *'Truss, lightweight, steel truss'*

b) How much control over the design did you have, including layout and materials?

Reusing a [NGO] design from another project. [NGO] controlled design.
'Mostly it was a different design that had already been approved, so mostly it was from [NGO]*, which has already given approval. And we showed that to the client and they gave approval from client.'*

c) If not you, who was the driver behind the selection of materials and technologies?

-

d) Were there other considerations that were taken into account when choosing materials, such as costs or material shortages, and what impact did these have?

CSEB – alternate technology, cost, has govt. approval makes it suitable
'The most preferable reason for CSEB was the alternative material to be promoted, as I think the cost of the project, eventually, if it was another material it would have cost a lot, compared to CSEB. And they have a limited budget and we have to finish in a certain time, and CSEB was the best technology to do that, and we had already got approval from government as well.'

e) If different from those used, what materials and technologies would have been preferable, if the barriers to implementing them were not in place?

-
'If there was no CSEB, then that would be a different question, but as we are promoting CSEB and that technology, so I don't think becomes a question about using a different technology I guess.'

f) When considering seismic resistance, how do these options compare against the implemented technologies?

CSEB – testing is good compared to other methods – best low cost material
'Structure wise, we have already got a test panel, like test results for CSEB as well, and they are pretty good, compared to normal bricks – 230 110 by 55 I guess, and that's already like, that's the best alternative that you can get in that low cost price, so that's pretty good I think.'

g) Did the head teacher and school representations have a say in the design of the new school and the facilities provided?

School is very positive about the design within the budget constraints (was initial disagreement and wanted more classrooms), but happy with the design.
'From the school side, from the community side they are really positive about everything they just want, at least, due to the number of students in the school, the government has slightly pushed on the budget of the whole thing, but at least they are getting what would be the best out of it, so at least they are happy on getting the school, and those kind of quality, and promoting the technology. They are really enthusiastic about that one, and that's all I think.'

5) Labour:

a) How were the labourers selected for the reconstruction?

For all reconstruction labour and masons cost a lot! Labour is most critical. Some local labour and local(ish) entrepreneurs involved in the reconstruction
P: *'Labour actually, the problem right now when we are starting the school, the reconstruction work from the earthquake not only for the schools, I am not talking about schools, but I am talking about the whole reconstruction – due to that, the cost of masons and labourers has gone totally insane, like pretty high, and that's why we have to manage on, the government rate is 1, and we have to pay much more, like double the government rate, and that's pretty high, and that's the main reason the cost of every construction is getting too much bigger in every aspect. So right now, choosing the labour is the most critical one. Right now, what we are doing is providing some local people during the construction work, as well as some entrepreneurs who are trained on CSEB, so they can work another reconstruction as well, apart from the school projects, so they will get knowledge about*

CSEB, as well as getting knowledge about school, and they can implement in other places as well, and it will help them in different places.'

I: *'And are those entrepreneurs local, or are they ones you have brought in from different projects?'*

P: *'Local in a sense, he is from the same area, but not from that exact village. So yeah, he is a local I guess'*

b) How much training for the labourers was required?

Full training needed, training provided throughout as part of the project – foundations, plinth, sill, lintel etc.. On the job training. Project leader delivers training and checks quality. For this project there is also a constant on site supervisor from [NGO].

P: *'As you know, there is a foundation phase, as well as a plinth level phase, and bricks phase, sill level, lintel level. Whatever stage there will be confusions for the local people, and we are not doing it as construction completion and then heading out from there, what we are doing is taking time to train the people over there, and then move out from there, so that the people who have been trained over there can build their own houses and schools over there, on their own, rather than us getting involved in that one. The trained people can get involved themselves'*

I: *'And how long does training take?'*

P: *'It's whole construction process, the whole way through, it's not like on a fixed day, where we are going to do training day, but rather step by step through construction, and they can see it and build it, and get proper knowledge of what can go wrong and what is the right way to do it. There will be one supervisor over there constantly, as it's a very tight schedule to finish 2 blocks in 3 or 4 months, so we have like, sending 1 supervisor over there and he will be looking after the whole project, and I will be checking over the quality and the material and the finances as well as management, everything.'*

c) On a scale of 1-10, how would you rate the skill and proficiency of the labourers to construct to the design?

Too early to say.

6) Were you involved in the provision of the temporary structures prior to the construction of the permanent school?

a) If yes, what structures were used, and were they earthquake resistant?

Not involved in delivery. Some stone masonry buildings, and using one of the structures that was still standing.

'There were stone masonry buildings that were made as classrooms. All of the blocks that have been damaged that still exist, all are stone masonry buildings, and apart from that, we have 1 structure that is still standing and that is the office building, which has some cracks, but we cannot dismantle it, as they need the room, but still they are living in it, that's all.'

b) If yes, how were these structures chosen?

c) If yes, what the intended life span of these structures, and how did this compare to the length of time they were used?

d) Were the temporary structures incorporated into the design of the permanent structure?

Organisational involvement:	**Engineer**
Participant number: 2 Position: See above Roles and responsibilities within the project: See above	
1) Which organisations and groups have been involved in the reconstruction project, and what roles did they play?	
a) School representatives: Getting the land, and providing logistical support – providing the water (challenging) and land, storage of materials and kit, resources etc.	

'Getting the approvals for the lands, like the providing the proper resources, like water, land, routes for the grounds, storing the materials, things like that – they have been really helpful in every aspect – not in procurement but in resources, providing, and they have been good at it I guess, but still we are struggling with water problems, because the [AVI?] is in a very water deficit area, and we have to bring water from very long distance – it is very costly and we are struggling on that one.'

b) Community:

Formed a committee for school reconstruction – need to pay for this but provide a channel to work through – from previous projects have seen this as an improved step, as the support is needed.

P: *'Actually, with the local community, getting involved on that one, is, in a way that they have formed a committee for the school construction meeting, like a committee that helps the construction team, for providing the resources and managing the resources. But they have to pay for that, but at least they have created a channel for that, for making the proper channel for doing those things.'*

I: *'Is that something that you've seen from previous projects that has improved the process?'*

P: *'Definitely – it is the most important thing in the construction one – if we don't get that kind of support, we might not be able to finish the whole project, like as we did in* [NGO]*, the community is supporting and that's why we are ahead of the whole thing, and we can finish it early'*

c) NGOs:

[NGO] – partner – construction/engineering.

[NGO] – donor. Built 8-9 schools in the area, some pre-quake, so have trend of working in the area.

P: '[NGO] *is the partner organisation for the construction, and* [NGO] *is donor. And* [NGO] *engineering is the contractor for the school'*

I: *'so in terms of* [NGO]*, they are the donor, do they have any other role?'*

P: '[NGO] *had already built lots of schools, 8 or 9 schools only in that area, so they had, they were assessing the alternative technologies which can be cheaper for them, and make the school low budget as well. And with the recent earthquake they had learned the lesson about earthquake resilient building, so at least from that one, they came to us, and after that, things have been working quite well'*

d) Engineers:

From [NGO]

e) Government:

Approvals, providing the land (local govt helped provide, but school don't own). Construction approvals. CLPIU, ward office etc.

P: *'For the approvals of the drawings, and providing the land for the school, and getting the whole construction approval for the building is done by the government I guess.'*

P: *'I think government organisation, all the government organisations, but they are different organisations – there is the CLPIU, the DEO, the ward office, the municipality, everyone is involved, all of them are government organisations.'*

f) Others:

-

2) How was the project initiated?

October contract was signed. [NGO] had trend of working in the area.

3) How was the project financed?

[NGO]

'Donor support I guess – I am not sure about that one'

4) If any, what were the challenges involved in each stage of the project?

a) Initial set up of the project and the team:

-

b) Agreeing a suitable design:

Reusing a design from a previous [NGO] project. Initial miscommunication/altered expectation of what was feasible to provide.

'it was not like a problem, but at least they wanted one extra room in that one, but we could, due to the lack of finance we couldn't do it. We are trying to work out, they already have 3 toilets and

it is an existing one, but there are some problems that we need to repair, but the people over there are telling us to make a new one, rather than the existing one, so we are still figuring out which to do, because it is the same cost, but with the standards we are given, which we are supposed to provide, it might collide with each other, so we are still trying to figure that out'

c) Constructing the design:

Transportation and labour increases costs massively! Need to transport materials a long distance (inc water – see above).

'the main problem which we have been facing is the transportation and the high labour costs, and it is a huge amount we will be spending on the project, mainly on transportation – I think that's all, the transportation and the high labour costs is the main cost. And the hauling the materials should be all from a long distance as there is no local market near to it, and that gives problems, that creates problems for transportation, for bringing materials in and everything, it increases cost in that way I guess.'

d) Others:

E.9. Case-specific 4

Details of the school:
Location:
Distance from Kathmandu (miles):
Distance from Kathmandu (time): 3-3.5 hours (car)
Accessibility:
Location of school within community:
People:
Age range of pupils: 3 classes, ages 3-10 *'Up to 3 class, from age group 3 – 10, age 3 – 10'*
Number of pupils: 62 *'28, total I think 28+32 – 62 I guess, 28 boys, 32 girls'*
Number of staff:
Facilities: (Prior to the earthquake)
Number of buildings: 1 building (TLC constructed from base of walls of existing structure) *'They had 1 building, from bamboo – put in after earthquake (i.e. the TLC)'*
Number of classrooms: 3
Number of storeys: 1
Toilets: 1
Assembly spaces: n/a
Outside facilities: 1 courtyard
Other facilities: (e.g. staffroom) n/a *'Just the classrooms'*

Reconstruction:	**Engineer**
Participant number: Position: Program officer Roles and responsibilities within the project: Technical lead and managing project *'Program officer, managing part as well'*	
7) At what stage in the project is the current school construction?	
Complete	
8) Timescale of the reconstruction project:	
f) When was the project initially agreed? October 2016 g) When was the design confirmed? December 2016 h) When did the construction work begin?	

Jan 2017

i) If completed, when did construction work finish?

August 2017

j) How long after construction work finishing were children able to return to school?

Straight away – lessons still running in TLC during construction

P: *''It was started in 2017, January, and I think before that 3 months'*

I: *'So the construction started in January?'*

P: *'Yes'*

I: *'And when was the design confirmed, was that confirmed at the point of agreeing the project, or was it confirmed over the following 3 months before the construction began'*

P: *'Design was agreed before construction started, 1 month'*

I: *'And when was the construction work finished?'*

P: *'August'*

I: *'and did the children go* back to classes as soon as construction finished, or was there a delay?'

P: *'No, during the construction also, the classes were running'*

9) Quality of the reconstruction:

c) On a scale of 1-10, how would you rate the quality and success of the reconstruction project?

8

d) Has anything negatively affected the construction process?

n/a (see later answers for more detail)

'no, not that'.

10) Design process:

h) What materials and technologies have been used in the reconstruction?

CSEB and mortar (mortar 1:6 cement:stone ratio)

'Technology is the same – blocks, and the mortar is cement and stone dust, and to make the blocks we use cement and stone dust in a ration 1:6'

i) How much control over the design did you have, including layout and materials?

In control of drawings and layout – material choice was led by NGO jointly

'I made the drawings, estimates and layout, everything.'

j) If not you, who was the driver behind the selection of materials and technologies?

Choice by the office rather than specific engineer

'It was the office choice, I just made the drawings'

k) Were there other considerations that were taken into account when choosing materials, such as costs or material shortages, and what impact did these have?

Fast, earthquake resistant, economical, there were trained masons from [NGO] project

P: *'It as fast, earthquake resilient, and economical'*

I: *'And it was started after there was already earth brick technology in the community?'*

P: *'Yeah, by [NGO], so the masons were trained already'*

l) If different from those used, what materials and technologies would have been preferable, if the barriers to implementing them were not in place?

RC considered (and was school choice), but not as feasible due to economics

P: *'RCC structure'*

I: *'And what were the reasons you didn't choose that?'*

P: *'Just the economical design – earth brick is an economical design'*

m) When considering seismic resistance, how do these options compare against the implemented technologies?

Similar

'Similar, horizontal and vertical bands, similar technology'

n) Did the head teacher and school representations have a say in the design of the new school and the facilities provided?

Original plan had been 3 rooms but school proposed the 4 that were adopted.

'no, the school proposed 4 room building, initially we had 3 rooms buildings before'

11) Labour:

d) How were the labourers selected for the reconstruction?
Local labour – already experienced from previous projects in the area
'Those labourers were already experienced in construction, they were trained by [NGO]*, and they were all local people'*

e) How much training for the labourers was required?
No more was given
'Sufficient, they were sufficiently trained'

f) On a scale of 1-10, how would you rate the skill and proficiency of the labourers to construct to the design?
6 - lots of guidance and corrections were needed.
P: *'Not much capable, 6'*
I: *'Did that mean you had to step in a lot, and correct them?'*
P: *'I had to guide them, make corrections'*

12) Were you involved in the provision of the temporary structures prior to the construction of the permanent school?

e) If yes, what structures were used, and were they earthquake resistant?
n/a
f) If yes, how were these structures chosen?
g) If yes, what the intended life span of these structures, and how did this compare to the length of time they were used?
h) Were the temporary structures incorporated into the design of the permanent structure?

Organisational involvement:	**Engineer**

Participant number:
Position: See above
Roles and responsibilities within the project: See above

5) Which organisations and groups have been involved in the reconstruction project, and what roles did they play?

g) School representatives:
Manager role, logistics, some influence in design.
END OF RECORDING – out of battery!
h) Community:
Volunteer labour (additional) e.g. for digging excavations
i) NGOs:
Design, supervision, seeking approval
j) Engineers:
Within NGO – design, layout, on site supervision and checks
k) Government:
Granting approvals
l) Others:
n/a

6) How was the project initiated?

NGO approached the school – it had been identified through a social mobiliser that the village needed a school.

7) How was the project financed?

[INGO]

8) If any, what were the challenges involved in each stage of the project?

e) Initial set up of the project and the team:
f) Agreeing a suitable design:
Disagreements with school proposing RCC design, and NGO said it wasn't feasible
g) Constructing the design:

Social issues – initially there was no road access to the school, so there was debates about land ownership etc. when trying to construct road. h) Others: (No issues with materials, all materials already transported by the time of the monsoon so access wasn't an issue

E.10. Case-specific 5

Details of the school:
Location:
Distance from Kathmandu (miles): 180-190km
Distance from Kathmandu (time): 8-12 hours *'8 hours nepali time, 12 hours European time. They keep making the statement that it's 8 hours, but it's not true.'*
Accessibility: Next to a local road, but ~5hr to main highway one route, or 1.5hr to a much worse highway P: *'it was next to the road'* I: *'next to a highway?'* P: *'no, not a highway'.* I: *'nearest highway?'* P: *'about 5 hours, down all the way to* [ward]. [ward] *was about 5 hours and* [town] *was about 2.5 hours.* [town] *was also a highway. If you go one way it is about 5 hours along the highway back to Kathmandu, or if you go the other way, to* [town]*, it is about 1.5-2 hours to* [town]*, but then the road I wouldn't call it a highway as the road is completely [****]. But it is a highway.'*
Location of school within community: Right next to the village, ~5minutes walk *'it was right next to the village, it was not centred inside, but on the walking distance of 5 minutes.'*
People:
Age range of pupils: Primary – class 1-5 and edc (kindergarten)
Number of pupils: ~100 but only 60-70 attending 'officially 100, but coming to school 60-70'
Number of staff: 4
Facilities: (Prior to the earthquake)
Number of buildings: 2 buildings – one was red-stickered after the earthquake *'the original school was damaged, a red government sticker. It had one building remaining with the green sticker, which had only 2 classrooms, and the biggest one had red so they were not using it. And the TLC was made of bamboo…'*
Number of classrooms: 5 (each the size for about 15 kids). 7 rooms (including 1 office and 1 storage) (The facilities that were provided in the reconstruction!)
Number of storeys: 1
Toilets: Toilet block with 3 toilets. This was damaged in the earthquake and rebuilt (earthquake resistant) on the existing foundation
Assembly spaces: Yes (football field – outside)
Outside facilities:

Football field nearby
Other facilities: (e.g. staffroom) 1 office and 1 storage room

Reconstruction:	**NGO representative**

Participant number: 1
Position: Project leader, fundraiser
Roles and responsibilities within the project: Collaborated with architect. Guiding volunteers on site and general logistics. Took over leading the construction when the architect left. (Architect had previous experience constructing other schools, project leader came on board as he had fundraised so had the available funds to construct a new school)
'Leader…..me and the architect were leading it. The architect had to leave after 1.5 months of leading it, so in the beginning he was doing the construction part and I was guiding the volunteers on site. But he was doing the next steps of the building and I was guiding out the steps of what was going on, and camp life, volunteers, food etc. I was arranging. When he left, I did everything – construction, camp life, food, everything you can think of. Mainly I was leading, but because volunteers were staying that long, they knew what was going on, so when new people came they took responsibility for showing them round the camp, finding them a place to sleep. People took over a lot of tasks, which was nice, and necessary.'

1) At what stage in the project is the current school construction?

Finished

2) Timescale of the reconstruction project:

a) When was the project initially agreed?

Beginning of April 2016

b) When was the design confirmed?

Re-used the same design as on previous projects, so straight away
'it was the same design as they made in [village] *just before. The only difference was in* [village] *they made 2 classrooms, and in* [village] *we made it with 3 classrooms.'*

c) When did the construction work begin?

Mid-April (17^{th} or 18^{th}) (~2 weeks after initial agreement) (the NGO took care of all the approvals)

d) If completed, when did construction work finish?

Exactly 100 days after – would have been shorter, but monsoon came early and caused delays. Mid July
'exactly 100 days – it actually had to be faster, but what happened was, the region where we were working, the monsoon came earlier, instead of June the monsoon came in May, so we were working a month in full-power rain.'

e) How long after construction work finishing were children able to return to school?

July 25th

3) Quality of the reconstruction:

a) On a scale of 1-10, how would you rate the quality and success of the reconstruction project?

7.5. The building is good, and solved problems as they went along (had to re-do the floor). Wanted more community involvement though
'difficult to say myself, as I look at it a different way, as I am organising it. If I looked at the full project, I would give it a 7.5, because the building was built perfectly, not a single mistake. The inside we had to do again, so that was one mistake that has been done but has been solved. But I would give it a 7.5 as we wanted more village people inside, the local people, and to get a lot more interaction with them, which didn't really work, and this is what I really want to change in the next project. People need to be involved, need to know the full story. Even at the end a lot of people were thinking we were making money. Next project, we will gather the full village – will hold a party….'

b) Has anything negatively affected the construction process?

Monsoon caused delays.

Transport of soil/sand/materials was expensive – long distance.
The corrugated sheets for the roof – the Chinese and Indian sheets didn't have the same wave, so they didn't match.
Needed patience, things don't happen on time.
'monsoon was a big difference, transport, Chinese and Indian tin sheets – that was the biggest [****] *in the entire building, the transparent tin sheets, because the waves of the Indian and the Chinese, they don't match, and that's a big joke. And if you can take transparent ones, to get sunlight in, they also don't match. So that's a big challenge on the roof, to get it waterproof, with waves that don't match.'*
'[village] – *we had problems transporting the soil from one place to another place, and then costs to hire the truck on really bad roads, and there was always trouble with it. Similarly was in* [village] *actually, transportation of sand from river, the distance was a bit far. Eventually though, with all these problems, the only solution is patience, if it's not today it's tomorrow, and if it's not tomorrow it's next week.'*

4) Design process:

a) What materials and technologies have been used in the reconstruction?

Earth bags. Initially plastered with natural plaster (mud, dung, hay, rice leaves), but this wasn't drying so switched to cement. Jute was also used inside. Some bamboo used. Used plywood on the roof but this was not monsoon proof!
'earth bags. Plastering with mud, hay, cow shit, and rice hawes (leaves of rice). And we also use jute, inside building was of jute. We did natural plastering, but during monsoon it didn't dry, so we changed that to a thin layer of cement covering jute. And we also used bamboo. (behind the [****]*).'*

b) How much control over the design did you have, including layout and materials?

None

c) If not you, who was the driver behind the selection of materials and technologies?

Architect led – used same design as on other projects.
'architect' 'because they had used it before, or specific to that project?' 'used it before, on the first project. ... it is beautiful, earthquake proof, don't need to spend much money – so many advantages'

d) Were there other considerations that were taken into account when choosing materials, such as costs or material shortages, and what impact did these have?

Earthquake resistant, and materials were available locally

e) If different from those used, what materials and technologies would have been preferable, if the barriers to implementing them weren't in place?

Would change plywood roofing (wasn't monsoon proof), but was just used as decoration.
Otherwise would stick with earth bags
P: *'something I would use different …. 100% plywood they used, yeah, 100% waterproof plywood, turns out to be not monsoon proof, right. True story, it's only like 70% proof, 70% monsoon proof'*
I: *'But that would be something, that if you could solve that problem?'*
P: *'Yeah, exactly. But it was only used in decoration you know, as a layer on the roof. Basically, finishes the roof, makes the outside nice. But it's not sustainable, it rains too hard for it'*

f) When considering seismic resistance, how do these options compare against the implemented technologies?

Earth bags are earthquake resistant
I: *'And you're saying earth bags are earthquake resistant?'*
P: *'Yeah'*

g) Did the head teacher and school representations have a say in the design of the new school and the facilities provided?

Got some say in where the school was placed, and the number of classrooms – changed from 2 from original design to 3.
'They could choose where the building came, and if they wanted 2 or 3 classrooms. And with the 3 classrooms that we provided, there were the old structure, and the green structure, they just had enough for 5 classrooms. But they have only 4 teachers, so that is a bit difficult to teach. They have just enough'

5) Labour:

a) How were the labourers selected for the reconstruction? E.g. local labourers, an established team brought with the NGO?

[NGO] – mostly international volunteers. 86 people from 20 countries throughout the project, advertised in hostels etc. in Pokhara and Kathmandu. Also used skilled labourers from the local villages e.g. welding, carpenters, concreting. (these workers were paid)

P: *'the organisation* [NGO]*, the head office is actually, the guy who runs it also has a hostel called [hostel], yeah and they have posters hanging up there, we have posters hanging up in Pokhara and Kathmandu, 40 of them, everywhere basically. That's how people basically came. We had 85 people in total, coming from 26 different countries. Specialised, we used the locals, well, like some welding staff, we used Dunga men, dunga master, carpenter, and concrete guys to make the floor, because to make the floor yourselves is very difficult. We tried it, and we went 'Ok, it is not straight, let's hire some guys'. Floor we tried, right, one classroom floor we tried. The toilets were different, toilet is a small surgace, and it is also not so straight we have to lay down'.*

I: *'So then you used local skilled people instead?'*

P: *'Yes'*

I: *'And did they come on as volunteers, or did they get paid?'*

P: *'We had to pay them. That is the difficulty with local people, to get them as volunteer, like we would say 'you get free food' – food in the village costs nothing because they grow it themselves, so it has no motivation. If you do it in Europe people say 'ah, free food, we save money and Euros a day, no food' and then if you have 3 times a meal then you save, but Nepali people, no.'*

b) How much training for the labourers was required?

Volunteers were guided by the architect and a few other skilled people in the group (mostly unskilled). These people were then also able to teach new people as they arrived on the project.

I: *'How much training did you guys get, and do you know how the skillsets were of the skilled people you brought on board?'*

P: *'It's like, what we developed during that project, like how to make a roof, something like that…So when I was working, it was definitely the architect who had a lot of knowledge, and a few other people who had a lot of knowledge about welding, or know this, or know this, and with their help we learn and they teach a lot of things, so you learn a lot of things on the way as well. And it's a lot that volunteers get, if you are on a step for one day, the architect, or me, and you explain it to them. But then, if new people show up and you are still on the same step, or same position, then the people that know teach the new volunteers. Like this, everybody is actually a bit leading and handing over their knowledge, so it is basically the purpose that if you join the full project, if you finish the full project, you can build the building. We explain everything to everybody. If you want to work with a tool, you ask, and we take the time to teach you how the tool works. If you don't want to know it, then you don't have to work with it either.'*

c) On a scale of 1-10, how would you rate the skill and proficiency of the labourers to construct to the design?

Local skilled workers were good – this was their profession. Although they did need some guidance on the specific details. (8)

Other volunteers had no skills to begin with but gained lots of skills throughout the project – knowledge was shared and people worked where they felt comfortable.

P: *'The local people that you hire, you know they do good, it is their profession. It is the only skill they have, if you are carpenter, you're a carpenter, if you're a welder, you're a welder, so the work they do is really nice. You just have to look, like sometimes you have to guide a little bit, for the details. Because we are used to, you know, details have to be perfect, but for them it's not that perfect. 8 out of 10'*

I: *'And for you guys, the volunteers that came in?'*

P: *'For the skills, you gain a lot of skills, like all the people who are like, different people who are digging soil all day, if they just want to dig, they dig. Basically, you learn everyday, but you can choose a bit, which labour you do. Like if we are shovelling soil all day, and if some girls are like 'this is too hard', then you can go do something else, like you can go and do painting or something,*

smaller stuff. Like my mother for instance, she came to the project, but I'm not letting her filling up earth bags, you know what I mean. I let her chop hay, or fill the soil, you know, the nice stuff. But nice stuff depends on what you want to'
I: *'So people's skills were managed quite well then?'*
P: *'Yeah, so you do what you do best, you choose where you work, that's the biggest thing'*

6) Were you involved in the provision of the temporary structures prior to the construction of the permanent school?

a) If yes, what structures were used, and were they earthquake resistant?

TLC made from bamboo, but not by this team. One was removed to make space for the new building, the other one remains, but is not being maintained.
I: *'Do you know if they school were planning to keep using it after, or was it going to get knocked down?'*
P: *'In* [village] *no, we went back and that TLC is just, we removed one, to put the new building, and the other one, the back wall is almost completely done, like bamboo is out. But they don't need it any more, so they don't use it any more and they also don't take care of it, even if they could use it for something, they are not using it. Maintenance is the biggest, zero.'*
I: *'So they are clearly getting the use out of what you built'*
P: *'Yeah, but they don't maintain it'*
I: *'So the school that you built, are they maintaining that?'*
P: *'No – the outside is natural plaster, so you have to take care of it, because it is natural. The inside is good, but the outside, just, in 2 hours you cover the whole building, and it is good for few months, but they don't do it. If some plaster falls out at the door gaps, because the kids are picking it out, so it takes you 2 hours to make a new mix and fill it up and make it perfect again, but they don't do it. I teach it and the people of the community, they don't care. In* [village]*, they didn't do the plaster again, they leave it.'*
I: *'Had the architect and you guys taught the school and the community how to do that?'*
P: *'It is a technique they use, for hundreds of years, everybody knows how to, how to plaster, they even know better than us. Sometimes they came and showed me how to, and it was pretty good, 'I'll do it that way', so we don't have to teach them.'*

b) If yes, how were these structures chosen?
c) If yes, what the intended life span of these structures, and how did this compare to the length of time they were used?
d) Were the temporary structures incorporated into the design of the permanent structure?

Organisational involvement:	**NGO representative**

Participant number:
1
Position:
Project leader (see above)
Roles and responsibilities within the project:
(see above)

26) Which organisations and groups have been involved in the reconstruction project, and what roles did they play?

a) School representatives:

Connection between the team and the village, no influence in the design
P: *'Be the connection between us and the village'*
I: *'And they got that say over the number of classrooms, and the position?'*
P: *'The design, no, they couldn't choose that one'*

b) Community:

Some local skilled people. Involved in camp life, cooking etc. (on a similar project in [village], the village also provided some basic labour too)

P: *'The carpenter came out of the village, the concrete guys came from the village, welders, the dunga masters, dunga means stone, so the guys who made the stone, who did the foundations, to elevate the building, the welder from the village, from the other side of the mountain but also locally. Yeah, absolutely, local craftsmen. The didi were cooking for us, the didi's. Yeah, because you need dal baht every day!'*
I: *'Were any of the community involved in the basic labour as well, or was that just you guys?'*
P: *'In* [village] *there was once in a while people came to help and they helped for like an hour, but not really full power working, they were just helping a bit and then often times would be the day they came and then they would watch, but help a bit less'.*

c) NGOs:

[NGO] – involved in the paperwork side of things, getting approvals etc. No involvement on site. (in [village] they had more involvement).
P: *'Paperwork'*
I: *'did they have much presence on site, or were they just based in Kathmandu?'*
P: *'In* [village] *no, in* [village]*, more. Yeah, but they more did only paperwork I think. In* [village]*, ……(?). In* [village]*, they came a few times, they helped preparing, finding volunteers a little bit.'*

d) Engineers:

Engineering was done by the architect (Polish)
P: *'All done by the architect – he is an engineer as well. HE is amazing, crazy guy'*
I: *'Was the architect also international or was he Nepali?'*
P: *'Polish'*

e) Government:

Granting approvals

'The government have to approve it, but we don't know much about the paperwork, that is all the other guys'

f) Others:

Materials – some local, some from biggest city nearby, would go and buy whatever they needed when they needed it. Earth bags from Kathmandu?
P: *'In* [village]*, you had* [name]*. You had* [name] *and* [name]*, and* [name] *was the funder of the project, and she was doing basically what I did in* [village]. [name] *was doing construction and* [name] *was leading the volunteers, the materials, the camp, the life. And then* [name] *left again, and* [name] *moved to me and then there was me. So* [name] *was a big part of the first one,* [village]*.'*
I: *'In terms of sourcing your materials, how did all that come about, was that all local, or did you get them in Kathmandu'*
P: *'Earth bags come from Kathmandu, soil – local, cow shit – very local. Hay, everything like that for plastering – local. And we have big pipes, tin sheets, hard wires, these come from the biggest city nearby. From the first shop you can buy, you would transport it. The closer you are, the cheaper it is to get it back up the mountain. IT may be more expensive in the shop but is cheaper to transport it'*
I: *'And that would just be you guys going to buy what you need?'*
P: *'Yeah, going and bargaining a lot, yeah we go shopping for materials, but always with a Nepali guy. But I did almost all the shopping myself. The beginning was,* [name] *did the full steps, I was doing publicity then, but then the others, the tin sheets, etc. you would just go to the shops yourself and try to explain with hands and feet if they don't speak good English. Or, just get, actually a lot of times, if I could not explain it in the shop, I would just go in the street and ask young people 'you speak English, you have 10 minutes?'. Young people they love to do it, they are really nice'*

27) How was the project initiated?

Budget, ground, location. Accessibility and feasibility of getting volunteers there etc.
Chosen an area to work in and found schools within that. Project leader had fundraised to do a project, and then collaborated with an architect contact from another project to do the design side, with the funds provided.
P: *'How the school got chosen was basically, with the budget and the ground and the location and all these stuff, all the previous schools I've seen, we decided to build that one, because it looks like the best one in all the things we look at, you know – accessibility, getting volunteers, getting*

materials, having space to build, having space to camp. At all the schools we check these things, and the best one you choose. That's why now we do a very big research – we are going to be visiting for a month, a month and a half for research, and we are going to have lots of locations, but then you can choose the best one, and everyone, you know, you have a lot of information to pick the right one'
I: *'So, you had just gone and done some exploring, looked at different schools, you had just chosen an area to look at'*
P: *'Yeah, an area. For* [village]*, no, but this time (they are in the process of setting up a new project), yes. I went to the Ramechap district then to [?] and [?] and went walking and found* [village]*'*
I: *'So it was just by chance that that school just happened to be there?'*
P: *'Yeah'*

28) How was the project financed?

Personal fundraising from project leader and other volunteers donating money. Cost 6721 euros. Initially had 3000 and found the rest throughout the project. Funding breakdown available on the [project] Facebook page.
I: *'And the project was financed by fundraising?'*
P: *'Yeah'*
I: *'and was that fundraising enough? How much did it cost in total?'*
P: *'6721 euros exactly. There is an open financial report. If you want it, it is on the* [village] *project page (Facebook). Because we want to work with transparency, there is no money getting lost, so you just open it up for everybody.'*
I: *'So how did you get the rest of the money, was the 6721…'*
P: *'I started with 3000, and I gave 300 to* [village]*, so I started basically with 2700. And then basically my family and my friends, and all the volunteers, basically everybody just shared it, shared it, shared it, and funds came from everywhere. The bar where I worked, they did a weekend, the barber shop, friends of me, they did a cutting day, and then volunteers give you 100 euros, 30, 20, all kinds.'*

29) If any, what were the challenges involved in each stage of the project?

a) Initial set up of the project and the team:

-

b) Agreeing and approving a suitable design:

For [village] school (architects other project), the layout/placement of the school – one classroom had no sun
'[village] *was a bit of a problem from the design side – with the transparent sheets. One small problem was one classroom was too cold, it didn't get enough sunshine, but apart from the building itself, absolutely no problems'*

c) Constructing the design:

[village] – transportation – only one vehicle available in the village and the cost to use it kept increasing (knew the demand!).

d) Others:

Everything was a challenge but everything worked out.
Expectations of dates and timings had to be very flexible.
'basically everything was a challenge, yeah, everything was a challenge, but everything works out. Making something in that part is so different than in our culture. If you ask something to somebody, to, for instance, you order this and say 'how much time' and then say '3 days', you know it's going to be one week or 2 weeks, but they will tell you 3 days. It was with everything like this – you are never sure of what you have arranged, until you have it. And that's a big challenge, but also after a while, it gets a game – it is fun – 'how much do you think?', 'how much do you think?', 'let's see who's right?'. I think in [village]*, transportation was your biggest challenge.' ' yeah definitely transportation, it was like, there was only one truck available in the area, and there was really bad roads, and we had to get the sand and the soils to the building spot, and so there was only one guy with a car, with a jeep, so there was the power to ask for more and more, says his truck is getting broken, he wanted more and more, and he was the only solution, so he was, yeah – it was a big*

problem. I almost get the feeling like he was trying to make a bit of money out of it as well, and there was a bit of tension. But, it worked out'.

Appendix F:

Phase two interview schedules

Appendix F. Phase two interview schedules

F.1. Case-specific interview schedule

School Reconstruction in Nepal: Case-Specific Interview

Purpose of the research:

This interview will be conducted with school representatives, engineers and NGO representatives involved with case study school reconstruction projects. Any participant in this research is free to leave the study at any time, and is not required to answer any question they do not know or do not feel comfortable answering. If they wish, participants can be provided with a short summary of the findings of this research following this fieldwork study.

The purpose of this interview is to establish details of the reconstruction of the case study school. The questions cover: details about the school and the community, the materials and design used within the reconstruction, the overall reconstruction process, the challenges faced during the process, and any mitigating actions taken. The data collected will be analysed and collated within guidance that could be used to assist ongoing reconstruction and retrofitting efforts. The responses given in this interview may be used within publications, talks and within my final PhD thesis.

The purpose of these questionnaires is not to validate the safety of any reconstruction projects. The interviewer is not qualified to assess the safety of any buildings, and will be unable to act on information regarding any potential safety issues raised, or provide any additional support to participating schools.

Confidentiality:

This research is being conducted as part of PhD research conducted at Newcastle University, UK. All data, responses and photographs collected will be confidential and stored securely on university hard drives, only shared with the primary researcher and supervisors, and will be disposed of securely on completion of the research. Where data and responses will be used within publishable work, all responses will be kept anonymous.

Audio recording:

The audio of the interviews conducted may be recorded. The recordings will be stored securely on university hard drives. The recordings will be used to provide a full transcript of the interviews, to ensure that responses are recorded accurately. A second interpreter may also be used to verify translations, if there is confusion over answers provided.

Permission:

I, _________________________, consent to take part in this research, and understand that all data provided will be used anonymously.
I consent to an audio recording of the interview being taken and used for the purposes of this research. YES / NO
Signed:_________________________

I, _________________________, within my role as interpreter for the interview conducted, agree to provide a full and accurate interpretation of all questions and answers provided.
I consent to an audio recording of the interviews being made and used for the purposes of this research. YES / No
Signed:__________________________

School Profile A	**Identifying number:**	

'This first set of questions is just to establish the key details of those involved in the reconstruction of the school.'

School name

Location of the school

City/town/village:

VDC:

District:

Staff and students

Number of students:	Number of classes:
Number of staff:	Age range of students:

Organisations involved:

Contact Details:

Name:

Participant number:

Phone:

Email:

Role:

Impact of the earthquake

'These questions cover the effect the earthquake had on the school, and the facilities provided in the reconstruction.'

School facilities: 'Could you tell me about the facilities the school has. I'd like to know about what there was before the earthquake, what was damaged, and what facilities there are/will be after the reconstruction.'

Facilities	Pre-earthquake	Earthquake damage	Post-reconstruction	Comments
Classrooms				
Offices				
Library				
Hall				
Computer labs				
Science labs				
Toilets				
Handwashing				
Outdoor				
Other				

Impacts for the school: 'Other than damage to the buildings, how was the school, the staff and students affected by the earthquake?'

(school closed / TLC / children leaving the school / trauma)

Impacts for the community: 'Have the community been affected by the damage to the school? If so, how?'

(Parents looking after children / shelter / providing funds / children helping families)

Reconstruction process and coordination

'Next, I would like to ask some questions about the overall reconstruction process, the timings, how it was set up and who was involved.'

Timeline of reconstruction: 'Can you fill in this timeline, telling me when each of these stages took place'

Identifying school | **Design confirmed** | **Construction work finishes**

I------------------------------------I---------------------------I---------------------------I----------------------------I---------------------------I

Project initiation | **Construction work begins** | **School reopens**

Project set up: 'Please can you give me some information about how this reconstruction project was set up'

How was the school identified?

Who started the project?

How is the project funded?

Project roles: 'What roles and responsibilities, if any, did each of the following groups take within the reconstruction process?'

School/SMC	
NGOs	
Engineers	
Labourers	
Government	
Community	
Others	

Reconstruction – structure and design

'This next set of questions focuses on the construction and design of the school'

Materials: 'Firstly, can you tell me what you know about materials that have been used within the construction, and where these materials came from?'

Main structure	Fired brick / RC / CSEB / Earth bags / Stone / Timber / Bamboo / Other
Foundations	None / Concrete / Stone / Other
Roof	Timber / Tin / Concrete / Other
Other	Water / Cement / Soil / Sand

Material Availability: 'Are there any limitations of using these materials, or any other materials that were considered and could have been used instead?'

Structural Design: 'I will now ask you several questions about the design of the school:'

Design: 'What can you tell me about the design of the school, from the layout through to the ways it has been made stronger and safer for an earthquake?'

Storeys	Shape
Size	Number of buildings

Earthquake details: Bracing / Ring beams / Lintels / Regular design / Other

Other features: Accessible ramps / Flush hinges / Doors opening outwards / Open benches /Other

Choice of design: 'Who, or what, had a say in the choice of material and the design? '

School / NGO / Engineer / Government / Community / Other
New / Standardised / Reused / Skills available / Materials available / Easy / Cheap / Quick / Other

Improvements: 'Reconstruction can provide an opportunity to upgrade facilities. Was it possible to make any improvements from the previous structure, and if not, what prevented this?'

(More rooms / Stronger / Accessibility / Other) (Budget / Time / Skill / Materials / Other)

Challenges and mitigating actions

Challenges:

'Were there any delays that occurred at any stage of the reconstruction of the school? If so, when, and what caused these delays?'

(Identification / initiation / design completion / starting construction / construction / re-opening school for use)

'I am going to ask you about some different challenges that have been identified in other projects. Please tell me how these challenges affected the reconstruction of this school, as either no challenge, a minor challenge, or a major challenge, and details of these.'

Challenges	No challenges	Minor challenges	Major challenges	Comments
Material quality/ availability				
Skill/ availability of labour				
Accessibility and transportation				
Government process				
Community involvement				
Land availability/ suitability				

Were there any other challenges that were faced within the reconstruction of the school?

Mitigation:

How was disruption to the school minimised during reconstruction? (TLC / combining classes / construction during holidays)

What actions, if any, were taken to overcome any of the challenges faced, either solving challenges that occurred, or preventing challenges from occurring?

Is there anything you would change about the process, in order to improve it, if it was repeated?

Community/location
'I would like to finish by asking you some questions about the community where the school is based, to understand more about the setting'
Accessibility: 'Firstly, can you tell me how easy it is to reach this community and the school, such as how far it is from Kathmandu, how far it is from a main highway, and the quality of the roads'
Distance from Kathmandu Distance to main roads Quality of roads
Hazards: 'As well as earthquakes are there any other hazards affecting this community, and if so, what, if any, actions are taken to minimise the risk of these?'
Flood / Monsoon / Landslides / Other
Community reconstruction: 'Can you tell me about any other reconstruction work that has taken place in the community? Have there been any links between this reconstruction and the reconstruction of the school?'
Houses / Health centres / Other
Nearby construction: 'Can you tell me what you know of any reconstruction work that has taken place in nearby communities? Have there been any links between this reconstruction and the reconstruction here?'
Houses / Health centres / Schools
Impact of the reconstruction: 'Lastly, what has been the effect for the school and the community, now that the school has been/is being reconstructed?'
End of questions: 'Thank you so much for your time and your help answering these questions. Do you have any questions for me before we end?'

F.2. High-level interview schedule

School Reconstruction, Rural Nepal: High-Level Interview

Purpose of the research:

This interview is to be conducted with representatives within organisations that are involved with school reconstruction in Nepal. Any participant in this research is free to leave the study at any time, and is not required to answer any question they do not know or do not feel comfortable answering. If they wish, participants can be provided with a short summary of the findings of this research following this fieldwork study.

The general purpose of this interview is to understand more about the reconstruction of schools in rural Nepal following the 2015 earthquakes. The questions focus on the role of this organisation, the wider coordination of the reconstruction programmes, the design and construction process, the challenges faced throughout the whole process, and finally, ways to overcome these challenges. The data collected will be analysed and collated within guidance that could be used to assist ongoing reconstruction and retrofitting efforts. The responses given in this interview may be used within publications, talks and within my final PhD thesis.

The purpose of these questionnaires is not to validate the safety of any reconstruction projects. The interviewer is not qualified to assess the safety of any buildings, and will be unable to act on information regarding any potential safety issues raised, or provide any additional support to participating schools.

Confidentiality:

This research is being conducted as part of PhD research conducted at Newcastle University, UK. All data and responses collected will be confidential and stored securely on university hard drives, only shared with the primary researcher and supervisors. Where data and responses will be used within publishable work, all responses will be kept anonymous.

Audio recording:

The audio of the interviews conducted may be recorded. The recordings will be stored securely on university hard drives. The recordings will be used to provide a full transcript of the interviews, to ensure that responses are recorded accurately. A second interpreter may also be used to verify translations, if there is confusion over answers provided.

Permission:

I, _________________________, consent to take part in this research, and understand that all data provided will be used anonymously.
I consent to an audio recording of this interview being made and used for this research YES / NO
Signed:_________________________

I, _________________________, within my role as interpreter for the interviews conducted, agree to provide a full and accurate interpretation of all questions and answers provided.
I consent to an audio recording of the interviews being made and used for this research. YES / NO
Signed:__________________________

Contact details:

Name:

Organisation:

Phone/Email:

Work Address:

School Reconstruction	Organisational involvement

Role of the organisation: 'I'd like to start by asking a few questions about this organisation: I'd like to understand more about your role, how this organisation operates, and it's involvement with school reconstruction in Nepal'

1. What are your roles and responsibilities within the organisation?
2. What is the focus of this organisation, and how does it fit within the broader programme of school reconstruction in Nepal?
3. When was this organisation established? If established prior to the 2015 earthquake, has the role and focus of the organisation changed due to the earthquake? If so, how?

Earthquake damage: 'These next questions focus on the effects of the 2015 earthquakes, and how this varied across Nepal and for different infrastructure'

1. How did the 2015 earthquakes affect school infrastructure in Nepal, and did this vary between schools in urban and rural areas?
2. Were there any significant differences in the effects to school infrastructure and other infrastructure?

Coordination: 'We discussed before the role of this organisation - these questions will focus on the overall coordination of all organisations involved in school reconstruction across Nepal'

1. Who is responsible for overseeing and coordinating school reconstruction in Nepal?
2. How does the process of identifying and initiating school reconstruction projects work, and does this differ between schools in urban and rural areas?
3. In what ways are school reconstruction projects funded - does this vary between urban and rural locations, and if so, how?
4. How does the coordination of school reconstruction in rural areas vary from the reconstruction of other infrastructure? Are there programs that coordinate links between school and other reconstruction in communities?

School design and construction: 'These next questions focus on the design and construction of rural schools. (This may not be something you have much familiarity with, but please just answer to the best of your knowledge)'

1. What materials are used and recommended for school reconstruction in rural areas? Does the choice of material vary by location, and if so, how?

(Fired brick / RC / CSEB / Earth bags / Stone / Timber / Bamboo / Other)

2. Who is commonly involved in the design and construction process for rural schools and how are they chosen? (Engineer / Mason / Skilled labourers / Unskilled labourers)

3. What would you say about their level of skill and experience? (Good / Adequate / Poor)

4. What can you tell me about what requirements the government have, in order to grant approvals to projects and designs (such as technologies, design details, quality of labour)?

Challenges: 'In this final section, I'd like to know more about the challenges that face school reconstruction projects, and how these challenges can be overcome'

1. From your experience, please could you rate the following factors as either causing no challenge, a minor or a major challenge to rural school reconstruction, and give reasons

Challenges	None	Minor	Major	Comments
Material quality / availability				
Skill / availability of labour				
Accessibility and transportation				
Government process				
Community involvement				
Land availability/ suitability				

2. Are there any other challenges affecting rural school reconstruction?

3. Are there any actions that you are aware of, that are taken to overcome or decrease any of the challenges already mentioned, and if so, what are these?

4. Finally – how successful would you say the current approach to reconstructing schools in rural Nepal is? Are there any ways that you think this could be improved?

(Very successful / Successful, room for improvement / Poor, lots of improvement needed)

F.3. Case-specific online questionnaire

School reconstruction in Nepal - Decision-making tool validation exercise

Thank you for working the tool. Please now answer the following questions, evaluating your experience. You are not required to answer any question you do not want to, and are free to leave the study at any time.”

Section 1: Project context

1. Please select the scenario numbers you were given at the end of each section of the tool: (if you did not record these, please select 'Unknown' for each)

1a. Government process:

1b. Site selection:

1c. Accessibility:

1d. Materials:

1e. Labour:

1f. Community involvement:

2. Please give details of the project you were considering:

2a. Which best describes your role within the project?

- School/SMC representative
- NGO representative e.g. project manager, project coordinator
- Engineer
- Government representative
- Funder
- Other (please specify)

2b. Briefly describe the location of the project you were considering (e.g. Village/VDC, Municipality, District)

2c. Which of these best describe the level of accessibility of the project?

- Easy to access
- Accessible but on poor quality roads
- Accessibility limited by seasonal roads
- No road access available
- Other (please specify)

2d. Which of these best describe the mode of implementation and initiation of the project?

- School/School Management Committee led
- NGO/donor led
- Government/international agency led
- Other (please specify)

2e. Which of these best describe the size of the project?

- Small (up to 5 classrooms)
- Medium (6 to 15 classrooms)
- Large (16 or more classrooms)

2f. Which of these materials were used in the main structure of the project school? Please select all that apply.

- Fired bricks
- Reinforced concrete
- Stone
- Timber

- Compressed stabilised earth bricks
- Earth bags
- Mud mortar
- Other (please specify)

2g. Which of these describe the involvement of different classes of labour within the project? Please select all that apply.

- Professional contractors
- Skilled labourers from outside the community
- Local skilled labourers
- Local unskilled labourers
- Local volunteers
- Other (please specify)

3a. Which of these best describe how closely you were able to match the true context of the project within the tool?

- No similarity to the project
- Small similarities but generally did not match
- Some key aspects matched, but not others
- Mostly matched, but some small differences
- Fully matched the project

4. Please detail any changes you would make to the tool, to improve how you can identify the appropriate context for a specific project

Section 2: Good practice

5. Which of these best describe how much of the good practice recommended, if any, was actually used within the project considered?

- None of the good practice recommended was used
- Some of the good practice recommended was used
- Most of the good practice recommended was used
- All of the good practice recommended was used
- The tool was missing key good practice that was actually used in the project

6. Which of these options best describe how suitable, if at all, the good practice recommended within the tool would be for the project you were considering, even if they were not used within the project?

- None of the good practice recommended would have been suitable
- Very little of the good practice recommended would have been suitable
- Some of the good practice recommended would have been suitable
- Most of the good practice recommended would have been suitable
- All of the good practice recommended would have been suitable

7. Please detail any changes you would make to the tool, to improve the good practice identified for a specific project:

Section 3: Value and impact of the tool

8. Which of these options best describe how helpful, if at all, this tool would be, if implemented within school reconstruction project(s) you are involved in? Please outline the reasons for your choice in the box below:

- This tool would not be helpful at all within a school reconstruction project
- The tool would be helpful, but not enough to make it worth using it
- This tool would not be helpful for me, but could be for less experienced stakeholders

- This tool would be quite helpful within a school reconstruction project, and would be something I would use
- This tool would be very helpful within a school reconstruction project, and would be something I would use

9. Which, if any, would be a potential benefit of implementing this tool? Please select all that apply:

- Better managing/planning the project
- Decreasing costs
- Better managing budgets
- Reducing delays
- Reducing timeframe/duration of construction
- Increasing quality of construction
- Providing additional benefits to school/community
- None of the above
- Other (please specify)

10. Please detail any changes you would make to the tool, to improve the value and impact of implementing it within a specific project:

Section 4: Functionality of the tool

11. Overall, how easy/hard was it to navigate and use the tool? Please give your reasons why in the box below:

- Very hard
- Moderately hard
- Neither easy nor hard
- Moderately easy
- Very easy

12. Was the tool a suitable and appropriate length?

- Much too long
- Moderately too long
- Neither too long nor too short
- Moderately too short
- Much too short

13. Please detail any changes you would make to the tool, to improve the functionality of the tool, if using it within a specific project:

End of questionnaire: please leave your email address - this is only to track who has responded, and will be removed from the data before any analysis is conducted.

Data Protection Statement:

This research is being conducted as part of PhD research conducted at Newcastle University, UK. All data and responses collected will be confidential and stored securely on university computer systems, only shared with the primary researcher and supervisors. Where data and responses will be used within publishable work, all responses will be kept anonymous. Any participant in this research is free to leave the study at any time, and is not required to answer any question they do not know or do not feel comfortable answering.

Appendix G:

Phase two interview transcripts

Appendix G. Phase two interview transcripts

G.1. High-level 1

I: … So firstly, we briefly just mentioned, how does the coordination of school reconstruction vary with the reconstruction of say other infrastructure, from how you've seen it? Does it massively differ for schools versus houses, or is it the way that work is set up and coordinated, or overseen, or is it fairly similar?

P: … I would say it is quite a big difference

I: Right

P: The main reason being that, for the schools, in our case it's donor funded, and we have funding to be heavily involved, like we are in charge of the construction, which means that we have our engineer to supervise there on site all the time. And we are 110% certain that the bricks are strong, that the school is safe, and earthquake resistant. In terms of houses … the challenge is that we don't have that type of funding, we have small funding to kind of support up entrepreneurs, so when they buy machine and training package, we can make a few visits to try and secure the quality. … But besides that, I mean, we are more working on developing technical tools, simple technical checklists, instruction videos

I: (Overlapping) Right

P: (Overlapping) Easy ways to monitor the quality without us being there, like nagging the entrepreneurs by viper (?) [app]. And then quite often just from a picture see like, does the work look good, do they have the rebar in the right place. Which is not ideal, ideally we should have millions of dollars in our bank account, supervise everything everywhere. So I would say that's the biggest difference.

I: Right

P: Another big difference is in house construction, with government grant support, and house construction without, or construction without government grant support.

I: Right

P: Because schools are quite, in Nepal … in terms of Nepal, it's more supervised at the moment, both from the government side and also the organisations, companies building, are quite often donor funded, and then there is rigorous process to make sure the school is well built.

I: So is that, set by the government saying that that has to be the case, or is that the donors that, because they are schools, it is something you want to do?

P: A little bit of a mix, you know, I'm not an expert, but I mean, in our case, quite often the (?) comes and visits, and also just, intrinsically you know, hundreds of children are going to be in the school, I think everyone in that supply chain or value chain to make that school happen, somehow know that this is not just, you know, some old person in a house, this is hundreds of children. And besides that, … I mean, a lot of the schools, I don't know the exact figure, you probably know, but, how many are donor funded, and when it is government funded there is usually a process. Or if Oxfam is building a school, or Samaritan's Purse, or some other NGO, they put a tender, it is very strict guidelines, their engineer will come and visit, they'll make sure. If the government builds it, I'm not exactly sure, I just know that the government is a lot more concerned when you build a school in general, that you build it according to the design. But of course, with that said, … I can count on one hand or less, how many schools have actually been visited by the government, after completion

I: Right

P: So it seems, almost like they are more interested at the time of bureaucracy and getting approval, want to know what. But then, we could potentially build something completely different, and most probably they would never go there, which is a little bit scary, because if someone has building something, and then…

I: (overlapping) …you can have a great design….

P: The government is not checking, then, the donor is not checking, and you don't care, then it might be, ... the biggest risk you might see is not a school and not a house supported by the government grant which has the, the checkings along the way to get the next instalment, it is when they are building, like a resort or house that is not funded, because then, they, there is very much less supervision and incentive to build earthquake resistant, it is more like, if you value it as a house owner, or as a resort builder, you will build it earthquake resistant, but if you want to build it cheaper, you can get it 50% cheaper if you don't give a, if you don't give a damn.

I: Ok

P: So we have seen some cases where, like that, where, some of our entrepreneurs both build and produce bricks, some of them just produce bricks and sell it, and we trained other masons

I: Right

P: and one of those masons, we've seen with the worst construction, was someone was setting up the, their own little resort, and they just said 'I don't care, I just want it to be cheap'

I: Right

P: And instead of like, ten rebars per room, they had only 4, one in each corner, and there was like, so many things that were wrong. But basically they didn't care

I: Right

P: So, what can we do, we can't tell them to tear it down, the government didn't care. Alright. So…

I: (Overlapping) From my perspective, it's great news for schools, but concerning for everything else.

P: Yeah.

I: (pause) How does the, from [NGO] perspective, how do you link your work if you were rebuilding a school in a community, are you able to link with other construction that's going on, or is that through the entrepreneurs and stuff like that?

P: Yeah, initially we started quite a few school projects, going into like, start building a school and then we'd hand it over to the community. Quite often that didn't work so well, like in some places they had little funding to support a few houses for vulnerable families, so they got a school and like five houses built. … But now, we kind of made the opposite, so now we have a large network of entrepreneurs, about 100, and then, we'll have a school building contract, we'll survey and see which are our closest entrepreneurs, who has done the best work so far, and who do we think will produce the best bricks. And we will give them the contract, to supply the bricks for the school.

I: Right Ok

P: So it would be more like, it boosts the existing enterprises near by. If we don't have anyone nearby we give it to someone who is within the same district, they shift the machine, make the bricks and then shift back. (pause) And then of course, like quite often what we use, what we do as a minimum is we train on a model house, but if we train on a school, that means lot more construction, so there is a lot more training involved, so that is surely, really good benefit of, of the way we are building schools.

I: And so would that generally be starting with a school, or would you start with houses?

P: So … now it's more entrepreneurs starting with houses on their own, and then we get a contract for a school, and then they also get to build the school, or at least supply the bricks. Sometimes also, include, we use some of their masons or labour that is local

I: Right. Because I'm guessing from a community perspective, houses are more prioritised?

P: … I mean it depends on how you compare, I mean, the hard part has been like, for example, if you want to build a school, and families have not yet build their houses, it is very hard to come and say, like, you have to contribute something from the community, which is something like, it looks really good for donors, and we are also really happy if we can succeed in that. For example, quite often we have, about half schools standing there, and it costs us a lot to take it down, so for example, if they can just bring it down, or they can at least have some labour to help us do that, that would save a lot of cost. But I think, since they feel like, 'we don't even have a house, I have to go to work, I have to try and make money, to try and build my house' then the school becomes secondary, also to them.

I: Um, so I know that [NGO] mostly use CSEB and stone, last year you said that you have the stone cutting technology, but you weren't doing any construction with the stone. Is that still the case?

P: Er, yeah, the thing, the big difference there is around CSEB, we already have, no around stone, there is already existing in the country, like, it … an old material, people already know how to build with it. There is hundreds of NGOs making the mason trainings. So what we target is the bottleneck, increase the efficiency of cutting and dressing the stones, where especially the corner and through stones are very important for the earthquake resistance

I: Right

P: And that's the most time consuming and tedious, especially if you do it by hand. But then of course, about half of our entrepreneurs are doing house construction, and half of the stone entrepreneurs are focusing on tiles and sending it to the cities, because tiles is quite often used for paving, if you have residential house. Not so much in Kathmandu, but in Pokhara they use it on the house. So they build with fired bricks, plaster it, and then they put stones, to make it look on the outside, make it look nice on the outside

I: Right

P: What was the question again?

I: So, just about the materials, so when you're … constructing, you focus on making sure they know how to do through stones and cornerstones?

P: Yeah

I: Ok. Because of part of what I'm interested in, is just looking at, stone in itself is not the world's greatest material, but by cutting it, and things like that, by using corner stones, it improves it in certain ways.

P: I mean, in terms of compressive strength, stone is amazing. It is way stronger than fired bricks and CSEB, unless you use very soft stones, but that is usually not the case.

I: And from what you've seen, is, is stone still used mostly, a lot in the schools, or would they try to avoid that?

P: … It depends on the remoteness basically, so the more remote, the higher the chance that stone will be used. So far we still haven't built any schools but we do have one school project which is a two day walk from the closest seasonal dirt road, and there we are planning to use stone

I: Right. And is that a project that [NGO] is hoping to be involved in the design and construction?

P: Yeah, we have the whole contract for it

I: Oh, right, that's awesome

P: It's running into a few issues, because it's like, very, very remote and the communities there are very, kind of sceptical towards government and outsiders

I: right

P: It's a little bit like a local construction cartel

I: Right

P: It's kind of like, we will have to see, which, when we started, unfortunately

I: Sounds interesting. Because..

P: …(Overlapping) it's kind of, this is our village and if you pay us this, or, it won't be a school, it's your village it's in your interest. But, ….

I: (Overlapping) from what you know, would the buildings in those locations just use stone or would they try and incorporate concrete, and ring beams and things like that, or would they have no…

P: It depends, mainly on the … remoteness. So if it's … if cement and sand and gravel is only crazy expensive then some that can afford it may use cement bands, or even cement mortar. But in places where it very very expensive, and they have access to timber, then they might use timber for the beams.

I: Right, ok

P: But it is also like, ok, like, you know, very roughly, [Draws diagram, Nepal split into four bands of topography] if we have Nepal kind of like this. Fired bricks mainly here [Points to terai]. CSEB is reasonable here [points to hill area in middle], maybe a little bit up in the more hilly areas. And here is stone [Points to third region, high hills/mountains], maybe with cement mortar and steel. And then up here [Points to mountains] it's basically just local materials

I: Just stone?

P: That is like the very rough kind of, super simplified. In reality it is more about distance and road access, so it is also, even if you go higher up north in Nepal, if you have road access and along the rivers, then people might still be building with fired bricks or CSEB. Or again, if you start going up and there is no road, it is stone, and initially stone with cement, and stone with mud mortar. And hopefully steel and RCC bands, but then, further up there might not be that, and they get timber instead.

I: Right, ok.

P: Because timber has been used a lot in the areas where there has been road access, so that's where most of the deforestation has been. Even if they've managed to reverse that trend in Nepal now, so the parts, the, I don't know the word in English, but, the forest in Nepal is expanding, it is a positive trend

I: Right

P: But where there used to be deforestation is where there was a road, because that was where there was an economy in cutting down the trees and processing them. So the areas that don't have road access is generally have the trees left, because there was no economy in cutting them down and exporting it.

I: Right. In terms of when you're making the bricks, what levels, what different soil tests, and kind of, processes are there to test the soil initially to get the ratios, and then the testing the actual bricks?

P: Yeah, so, for the soil testing we usually use two simple tests. One is called jar test and the other one is wash test. Basically all you need is something to stir with, and a jar or a cut off water bottle. And with this one you get, like, …, plus/minus 10% correctness, and it's not amazing, but it's the only test where we can train entrepreneurs and they can actually replicate it themselves. And based on the result we add sand and gravel, so we have at least 55%, and we add 10% cement. And during the curing, the 10% cement binds with the sand and gravel, and not with the clay and the silt. And that's why sand and gravel is so important. And then, in terms of testing, we've tried to work out different methods for more simple testing. We have lab equipment here, and a compression tester, so as much as possible we encourage the entrepreneurs to meet us somewhere, or to send the bricks when they are going to Kathmandu, or have people who are going. And then we test for free for them. However, to make it more regular, we are still developing a low-cost compression tester and we've tried different methods, I can't remember the … the words for them, like drop test, and then there's another one where you can kind of put weights…

I: (Overlapping) Right, Ok

P: (Overlapping) To see if it breaks. But they haven't been correct, or specific enough, enough. It's been too much of a variation of the same strength and the same force. So we have a tiny little compression machine, that costs like, $300 to make, and that we're planning to sell for $200, to encourage the entrepreneurs to get it, and it's designed so that they will be able to use it. The only thing is that we've designed that ourselves and there's been a lot of issues in the manufacturing in the quality, and it's been half a year delayed unfortunately. But that is the main solution we're working towards, because then the entrepreneur can continually monitor.

I: (Overlapping) yeah

P: (Overlapping) And we can even project, so after 14 days, it should be I think, 68% of the strength, of the concrete. And then you can kind of see. 'Is this a strong brick, is this a weak one?', and you can kind of quickly adjust your mix. And as well as house owner confidence, they go to the entrepreneur and they say 'Oh, this material is ****** [bad]', and the entrepreneur is 'no, no, wait here…'

I: 'I can show you'

P: 'I use this machine, yes, it's 5kPa, the government minimum is 3.5, and then what do you, do you want to build with this, or should we also compress one of the fired bricks, and see what strength that has' and you know, they can make a better sales argument, and the households can be more confident it is strong.

I: Um, some, I was speaking to somebody who was saying … they think, fired bricks, are the way forward for all of Nepal, and that kind of, there isn't a need for CSEB, but, what would you for that, why do you think CSEB is much more effective?

P: I would say, kind of like, when Apple came with the IPhone, that's a little bit the situation, like, why do you need a smartphone, that earlier adopters early on saw, like, 'this is amazing, I can chat with my friends, I can google things, I can check when the bus is going … I can book flight to somewhere, I can do everything', and some people said like, why do I need to do that, like I just want to do that when I'm on the computer. And it's a little bit the same here. But the key is that, none of the materials that we see are perfect for all of Nepal, that is the main conclusion anyone that is reasonable will draw after having some experience with this.

I: Yeah

P: And we also, not saying CSEB is the best material, that's why we're working with stone as well. So basically, in terms of environmental performance, fired bricks is terrible wherever it is, that is no question about it.

I: Right

P: In terms of cost, and earthquake resistance … it has it's suitability or feasible areas, which is urban areas, the plains, and low hills.

I: Right

P: And maybe along … the river, in the higher hill areas, but, carrying fired bricks on someone's back, for two days, it's not feasible, it's not feasible all over Nepal, and that's where you need to see like, what is the, take all those parameters into, where mainly, in terms of social impact, it's mainly low cost and earthquake resistant. And then of course, besides that, westerners and thinking for globally, we have climate change, so if the material has good climate performance, then that should also be measured into that, those factors I think. But in terms of local people, they don't really care if the brick is environmentally safe, and I understand that, they are on a different level, like if you don't have a house, you don't fricking care what is the best material at the lowest cost. But as companies, as institutions, as government, as donors, we can think about that third factor as well. And fortunately, in a lot of the hilly areas, CSEB is equally or more safe, because the bricks are stronger, and less broken than the fired bricks if they've been transported for hours. It's less cost, and way better at environmental performance.

I: Do you know how it compares in terms of construction time, because the projects I viewed last time, the fired bricks, the fired brick schools took longer to build but they were bigger schools so it was hard to…

P: (Overlapping) Well, in terms of just technically, CSEB is way faster, because it is interlocking, so, er, with, lower, man, less manpower and less skilled man power you can build faster.

I: Right

P: It's about half the manpower in wall construction

I: Right

P: Then, of course, in terms of, if you just want to build one school, and you're in one area, the thing that CSEB doesn't have, is that it is a new technology, so not all masons know of this, not all contractors are familiar with the material, so, in some areas, we are kind of established, and some of our most … in the districts where we have the most presence, a new entrepreneur would just need the mason training because everyone in the district already knows about this material. … Whereas, if they are the first entrepreneur to build with it in a new district, no one will know how to build with it.

I: Yeah – oh right. … And then, last time I was here, I looked at, I asked about various different challenges, and from that I've collated a list of the six that kind of, commonly cropping up, and what I'm trying to understand is, for different projects where they are a bigger or smaller challenge, or not a challenge. … And it might be that there is some variation depending on where you are working, but, … for each of the challenges, are they no challenge, a small challenge or a big challenge? So, material quality and availability?

P: Material quality and availability? In terms of what material?

I: So, I guess you would know about stone, or CSEB, so accessing it…

P: So, stone is always high quality, for example. CSEB is what we're trying to make sure it's high quality. The biggest challenge is not the material, the biggest challenge for us is entrepreneurs, either independently importing machines and don't know how to produce strong bricks, or we have a few local small companies that are selling machines with, like, one day or no days of training and just selling the machine. Which is like, corrupting the market. And that is why you hear from here and there, that CSEB is not a reliable material, because there are some of these crazy entrepreneurs out there that aren't following the procedure to make strong ones

I: Right

P: … But, I would say my general perception is that it's, in the general areas where we work, over the time of the earthquake … reconstruction, and increasingly construction, materials have deteriorated and prices have increasing.

I: Right

P: So, it wasn't a very simple answer

I: None of them are very simple challenges so…

P: I mean, most families building a house, or most places where you'd want to build a school, it's a major challenge to get good materials on the site so you can start building. Fired bricks are breaking on the way, cement has not been stored properly, and the supply is less than demand, so people are paying high prices for low quality materials that maybe you shouldn't even build a ****** [bad] shed with, and those materials end up building a house or a school.

I: Right, … skill and availability of labour, so taking into account like, training process that you have and things like that?

P: … Some sites it's major, and some sites it's minor.

I: right

P: The, biggest challenge for us is skilled manpower, especially since we have to train the skilled masons, how to build with this, and if they end up migrating, or going for projects somewhere else, then we train someone new all the time. … But somehow, I don't know the equation but, it just surprises me every time, there is a high unemployment rate, but still we cannot find labour in so many sites.

I: Right.

P: And people are migrating from Western Nepal because there the unskilled labour charge per day is 500, and in an earthquake hit areas it's 1000, because local people there don't want to take the jobs, which I think is crazy, but yeah.

I: But in a way, like, kind of looking forwards, when you look, when Nepal are then looking to work in Western Nepal because those buildings are still really vulnerable, if they've worked here and received some training, then hopefully it's positive.

P: Yeah, be better there as well.

I: Accessibility and transportation?

P: Major. Not all of our sites, but it's basically, the more remote and the harder to access places that are falling behind, then most in reconstruction.

I: right. … Of the sites that you work on, how many would you say, really roughly, have vehicle access, or is that…?

P: (Overlapping) So in terms of vehicle access. Like half of them have almost year round, and half of them have just half the year, some type of vehicle access. Which means that if it's raining heavily for three days, it's monsoon, like, almost no site, but, and then, we have a few sites, but not so many, that are walking, like no road at all.

I: Right. … Because, like, from what I've seen so far, it's those sites that have no vehicle access that are really falling behind because people just don't know they're there, or can't get to them

P: Yeah, and it's more expensive, and those are normally the more vulnerable groups so they can't stand up for themselves and demand that the school needs to be built in their area.

I: Is there much challenge, from your perspective, from the government, in getting approvals?

P: yeah, it's super slow, and bureaucratic.

I: Right

P: and that goes for almost anything in Nepal, banking is a nightmare. There is basically no functioning online banking in Nepal.

I: But online banking is everything!

P: Like, you can see the amount but you can't see any details, who sent you money, what was the currency conversion rate. You have to go to the bank and ask for it. And it's basically the same here, it's a little bit slow, and not so transparent.

I: Now that, you've obviously got a bank of designs that you've previously done…

P: (Overlapping) That makes it easier

I: Did you find it easier now that…?

P: (Overlapping) Yeah, because you have a type approval, it's easier to get site specific approval with that type design that you've approved, yeah.

I: Right, ok. Um, the community involvement, some people have had really positive experience with the community, and some have found this a massive challenge.

P: Yeah – I wouldn't say it's our strength, but if we have a, in the case of working with local or very small NGOs we've had an amazing experience. Because there the community is not expecting handout, they are expecting that they will get something if they work hard

I: Right

P: With large NGOs it's been a major challenge, because the local people see 'Save the Children', or 'Oxfam' and they are just sitting back and waiting for handout.

I: right ok

P: and in terms of entrepreneurs, we've had a very positive experience as well because they invest their own money, and they are working their asses off.

I: Yeah. That's something that I've seen from [NGO] that I've not seen in other places as well, so, kind of, really, really prepping, because a lot of people really want to give communities ownership, but that's a very, very (?) Way of doing it.

P: That's kind of why we're turn the house, the school construction around, instead of us coming with the machine and trying to hand it over, we start with an entrepreneur, that starts by investing 30, 50 or 100% of their life savings, then we can be quite sure that at least one person, and his or her family will care. Which is a very good start!

I: Yeah, definitely. Land availability and suitability? From what I've seen, some schools, or a lot of the school sites, especially from before the earthquake, were the poor quality land that no body wanted. So is that something that you still face?

P: … Yeah. So it depends where you're building again. So usually the more, like, higher hills, the harder it is to find suitable land. So, in some, not many, in projects where we've been, kind of a partner, it was kind of like, either we've built, build on this terrace here, which might live up to the minimum requirements, but if we don't build here, there won't be a school. And … so what decision do you make kind of, ….

I: (Overlapping) Do you find that that increases the project cost, to have extra foundations or anything? Or is it still fairly standardised?

P: … The thing that has increased most of the project cost is that the cost of tearing down the old school is usually quite high. And then, it's hard to check before, if the school is standing there, so there might be a lot of rocks, and then you need to build, like, bigger foundations to accommodate like, that.

I: Right, OK.

P: In one site, in one site, it never got started though, it was the same there, like we required the donor, and us, we required the community to contribute, and the only land they were able to contribute was completely unsafe. And then, some other issues arised, and we never got that project started. So there is definitely an issue.

I: Right … and then are there, we've kind of touched on a couple anyway, but are there any actions that are overcoming some of these challenges, or decreasing some of these challenges, and ways that you mitigate and work around them, that you specifically do?

P: I mean, working with CSEB we reduce the need of, for materials, because we use local materials. In terms of skill, the availability of labour, we are trying to help and mitigate that as well, by training local people. Um, transportation, what we're working with there is, trying to convince, like, we need to start building the school now, so you and the school committee and the local government and ward, and the community, you need to build this road now, so we can finish this school before next monsoon.

I: So, are you linked with some of the road construction projects?

P: I mean, it's not really construction projects, it's the seasonal dirt roads that gets rebuilt by the local community and government each year, so it's more trying to convince them that it needs to be done now, not next month.

I: yeah.

P: … Government process, it's a learning curve, so I mean, it's a learning curve, so us working with them, I wouldn't say they have improved so much, maybe it's more that we have learnt how to…

I: (Overlapping) How to work around?

P: (Overlapping) How to navigate the landscape…And community involvement, working with local entrepreneurs, you definitely work around that.

I: Awesome, how, my last question would be, how successful would you say [NGO's] current approach to rebuilding schools is? And are there things that you're wanting to do to improve that, but currently just aren't possible, or are you happy with that process?

P: We're happy with the process, yeah. The good thing is that with our network of entrepreneurs, we don't need to, the donor don't need to buy the machine, there is no starting phase to get the bricks produced, producing, because we already have entrepreneurs in most of the areas, so it is quite easy. So that's improved quite a bit.

I: Right.

P: … One thing we are working on though, is, that, we're trying to make an approval, so that, if you have a drawing with RCC, basically, it's RCC that holds the load and makes it earthquake resistant. And we run into some trouble in one school, where were, the drawing is, there are two places, the drawings are for RCC with fired bricks, but the donor couldn't buy fired bricks, or it was completely unfeasible because they got too expensive. So then we said, 'Hey, we'll just start some production of CSEB here and lower the cost by 30%, and the RCC is the structural component anyway, and … the properties of fired brick, and fired, … CSEB in the wall is basically the same when we have RCC anyway'. But then some government guy came and said 'this is definitely not good, and this and that' and now we are in a big process to prove that…

I: (Overlapping) To prove that it's still fine

P: (Overlapping) yeah to prove that it's the same, so.

I: right. Ok.

P: The most limiting factor for CSEB is that there is still just approved designs, there is not a construction guideline as there is with fired brick. So with fired brick there is several rule of thumbs, or guidelines, which if you just stay within those, you can build any type of house, or any type of school, and you will be fine. … For CSEB, still you have to follow that exact design

I: right

P: if you don't follow it you can sometimes, the easiest is to approve it locally, but that is still like, not a big hassle, but too big of a hassle for family to kind of bother.

I: Right

P: And that is the biggest challenge for CSEB.

I: Right, OK.

P: That, and quality, but quality it the challenge of everything.

I: Awesome, thank you very much.

**** end of interview***

G.2. High-level 2

I: So what's your role within [NGO]?

P: Within [NGO]? So basically, my role is previously, I was with the school project, called [Project name]. Therein, um, the school project provided disaster education and, like various practical disaster preparedness, er, methods and all. So, I was the focal person for compiling all the information like, as in how many training happen and what happen and what things were done. And I, … I used to get information from the field staff, and has to compile the information and report it the office, make reports, make newsletter, make news, and put them on the website, so those kinds of information. Now, I'm in the communication department, so, but mostly I'm responsible for the school related activities as such.

I: Right

P: So basically, circulation of information and news.

I: Right

P: and development of IEC materials for school children basically, and since I have come here, we have managed to … develop some IEC materials which has been, which is separate for primary school students and secondary school students. So those were the things.

I: IEC?

P: Information, education and communicational materials

I: Right, Ok. … And, we talked about the last one last time. … So, we talked a little bit about this last year, but how did the 2015 earthquakes affect school infrastructure, and how did that differ between urban schools and rural schools? So, damage, but also, kind of, delay in learning, how quickly schools could return, things like that.

P: [Agreement] So, as much as I know, with schools, what happened was, with the badly affected 14 districts, one of them being Kathmandu, and when I joined this organisation … the focus was more on, what, when I saw it, the focus was more on schools outside Kathmandu. Because, in Kathmandu, [NGO] had done some retrofitting work with various schools. Retrofitting was mostly done within Kathmandu. Kathmandu, Bhaktapur and Lalitpur. But then, and so, I got a chance to go to the other districts, other affected districts, especially Nuwakot – I travelled to Nuwakot a lot, and there, … I could see temporary learning centres were being set up by various NGOs and INGOs. They move to temporary shelters, and then after that, lots of commitments from donors, and … various schools, were being built, and some, there were some delays, but I think in terms of, infrastructure, school reconstruction, although it is slow … according to my understanding, I think schools have been prioritised, and the reconstructions have been going on in parts such as Nuwakot. But then, even in districts like those, I could see that the central places were reached to first, and the remote locations, they were sort of neglected by the private organisations. And where I could see that, I might be wrong but, the government was able to manage to reconstruct some of the rural schools, which had not been touched by other donors

I: Right. And was there significant differences in how schools were affected versus say housing and hospitals and things like that?

P: (Pause)

I: Is that something you can…

P: (Overlapping) I am, coming here, I am only reading about schools, schools, schools, so I can't compare at length (?). What happened to the, like, housing sector. Of course, it is the biggest priority and it has been affected as well. And immediately after housing, what we hear is schools itself, and then the cultural heritage part.

I: Yeah

P: And others, hospitals and others. But schools, are, I wasn't comparison – what was the question, sorry?

I: … So schools versus other infrastructure, so houses, hospitals, things like that

P: Houses, hospitals, yeah. So ... the destruction, like I said, I am only more inclined to answer schools. Other, like how much has happened ... yeah

I: Ok. And who's responsible for overseeing and coordinating school reconstruction in Nepal?

P: The, after the earthquake, they've started project implementation units, for each, not for everything, but for schools, under the ministry of education, science and technology, there is the CLPIU education – central level project implementation unit, and they have formed DLPIU – district level project implementation unit, in 30, in, I think the goal was to establish 30, in 30 affected districts

I: Right

P: But, until last year, 14 DLPIUs had been established in the most severely affected ones. But 32 engineers had been assigned, but I don't think offices as such were established in the 30. But maybe now the scenario might have changed.

I: Right

P: But under the [NGO] project I remember, um, they had a training for engineers and they had about 32 engineers assigned under the DLPIU

I: Right, OK. And because those DLPIUs are obviously very newly constructed, they run training, but how are they supported, because obviously it's then a big challenge for them to take on the reconstruction work, so are they linked with support from other bodies?

P: I think so, I think they were linked with the District Education Offices of the districts but now the whole restructuring, like you might be aware of the new government setup. So previously there used to be a District Education Office in all the districts, but now … there is rural municipality office and under that there is chairperson, Vice chairperson and each…, it has a different unit for health and education.

I: Right

P: So all the staff and the district education offices also merged. It comes under the municipality office.

I: Right

P: So probably the DLPIU offices in, previously they used to have connections with the District Education Office, but now I think, they will be more linked with the rural municipality office.

I: Right ok. And the DLPIU is that again separate for education, or is that for reconstruction?

P: For reconstruction

I: Ok. … And then how does the process, find, like identifying schools?

P: … I'm sort of confused by that question. DLPIU – I think they have different ... for CLPIU they say education, or housing, but for DLPIU maybe they have a staff assigned in the office

I: Ok

P: Need to check

I: Ok, I'll look into it. How does the process of, like identifying schools, selecting schools, and setting up those projects work?

P: Um, projects as in ...?

I: For, to reconstruct schools...

P: To reconstruct?

I: Because there's an initial disaster assessment which identified how much damage at each school. But then, how do schools get identified, say, specifically for the [NGO] project or a different organisation coming to work at a school

P: (Pause) I think they could do coordinate with the government. And the major chunk I think there were commitment from ADB and JICA. Those were the biggest donors. Ever since I have been to conferences and symposiums, the CLPIU people, when they make presentations, the CLPIU, they always, they always put up saying ADB has made commitment for 300, and JICA has, I'm not sure about the estimate, but those two were the biggest ones. And, I think, with others, they decided where the two major donors have focussed and then the other remaining parts as such. And some cases, I do think they decide first and then consult with the government, I'm not really sure how they work

I: And how do the 12 schools for the [NGO] projects identified, do you know that or not?

P: I was here when it was almost over

I: Right, ok, fair enough.

P: The districts were, er, severely affected districts, and I think with the, with the [NGO] project, they were, they've got the integrated schools, the focal, integrated as in deaf and, yeah, and that was the main highlight, they decided to include those kind of schools, maybe that was a special consideration

I: Right ok. Yeah, that sounds familiar from what I read in the report

P: Ah ok

I: And then you said they were funded by ADB and JICA, not the [NGO] project but in general

P: Yeah, in general

I: And then, what other funding mechanisms are there for schools to be reconstructed?

P: Government, NGOs, INGOs, personal donors, people from abroad, donations, charity

I: … And are there programs that coordinate the links between school reconstruction and then reconstruction in other sectors. So between schools and houses within one community? Are there links for that construction or are they completely separate?

P: Probably separate. With the things that I am aware of, I have seen, I have not seen, like even here projects we have, we have a project called [Project name] that provides technical assistance to the housing communities, and whereas the school projects only works in schools. They do … with the other projects they go into the communities, the social mobilisers, they go into the communities and make orientations about safe constructions in the communities. But … not in terms of reconstruction, but I think, while in the school project, they do go out, the school staff, the social mobilisers, they did go out into the communities and talk about safe construction and disaster preparedness, but not, erm, the reconstruction itself, was not in schools and housing. Either just orientations to the communities.

I: Right ok

P: And always involving the school. Whenever a school was being constructed, the School Management Committee was always … brought into the meetings and orientations, and that's how they were involved as a community.

I: Right

P: In terms of the school reconstruction.

I: Right, Ok. Cause that's an area that I'm hoping to look into more, and how you can use the school as a catalyst, and thinking about, if you're training masons, they can then build homes. … These are the questions you are probably less familiar with, the technologies.

P: I'll just read, and that (Pause) [Reading] what materials are used and recommended for school reconstruction in rural areas? Does the choice of material vary by location and if so how? [Reading] Yes, I think it does vary by location … fired brick, RC, I've seen stone being used, and bamboo as well, timber, fired brick, fired brick, is that?

I: The normal bricks

P: The normal bricks, yes, so these, I know that I'm familiar with these, whenever I have seen it in rural areas

I: Ok

P: [Reading] Who's commonly involved in the design and construction process for rural schools, and how are they chosen? [Reading] Here, we could see, if it's done by organisation like ours, then definitely the engineers are involved, masons are involved, skilled labourers are involved. But I do think that sometimes, like not all the schools have access to these kind of facilities, so unskilled labourers might be used, I don't know

I: Right ok

P: [Reading] What would you say about their level of skill and experience? [Reading] With the trained ones, will be good, inevitably. Otherwise, in places where there is no access, they might be poor, but I can't say for sure, they might be

I: yeah.

P: I can only talk about things I have seen.

I: Yeah, that's fine Well those are the things that I'm trying to pick up on, rather than what you can say on paper.

P: [Reading] What can you tell me about the requirements the government have, in order to grant approvals to projects and designs, such as technologies, design details, quality of labour? What requirements the government have, in order to grant approvals to projects and designs? [Reading]

I: So do the government say, stipulate that you have to like, prove that, skilled, like, prove the qualifications of the mason that's involved, or they, the designs obviously have to be to the building codes and things like that?

P: Yeah, yeah, yeah, yeah

I: Do they have rigid guidelines?

P: I don't think so, but, or maybe, I'm not, I can't be sure in saying, with designs and stuff, yes, they do ask for it, but I don't think say, show the skills, or, they might just ask...

I: Right ok,

P: But, I'm not sure about how strict they are in terms of it.

I: Ok.

P: (Pause) [reading] I'd like to know about challenges that face reconstruction. How are the challenges... from your experience please could you rate the following factors in causing challenges, minor, major. To rural school reconstruction. Material quality, challenges, minor or major? I think it depends on the place, like, you say, even if it's rural, like you say, central part, you saw the central part of Sindhupalchowk, you said there were more access, so there's no challenge right, but say, in [School name] there is a challenge, so it depends, I find, I can't say, there's different answers for different places, no.

I: Ok

P: Skill availability of labour. The same.

I: Ok

P: the same

I: Ok

P: Accessibility and transportation. You know this all. … Yeah, so, schools like [School name] where we went, there is easy access and transportation to all the materials, so no problem, but with rural places, oh, just rural no? With rural, there is a problem, in Nuwakot too, there is one school, which I need to go to visit, but I am only able to go during the non-monsoon times, and it had been delayed because it is so far away. It had already had commitment right after the earthquake, but three years on, they, the donor didn't let them, didn't let other organisations make a temporary shelter, they said 'we'll make a permanent one', but then they didn't have any access, they, they had the zinc sheet on, and the wind used to blow it away, and they used to starting open grounds, but after three years, nothing had been done by the organisation. So problems like those in the rural areas do exist because of transportation.

I: Right

P: Government process. This is a challenge. Major, minor, can I say? Sometimes things happen quickly, sometimes they take time.

P: Community involvement, it's pretty good this one

I: So this can be a positive?

P: it is positive, yeah. Land availability, it's a challenge, major challenge. The schools mostly get donations of land in difficult places. This is a challenge. Are there any other challenges affecting rural schools? So many challenges already. [Reading] For school reconstruction, are there any actions that you are aware of what are taken to overcome or decrease any of the challenges already mentioned? [Reading]. I think a level of awareness has come about, say for example, previously the land given to schools, or just the land that individuals didn't want to construct houses, they used to give it to the schools, but now, an awareness has been developed, that no schools need an ideal spot for the kids, so those kind of things

I: Ok

P: (Pause) [reading] taken to overcome or decrease ... [Reading]. And, all the disaster preparedness and disaster awareness has also been raised due to the earthquake and, just the practice of building, following the building codes has also been a good step.

I: Right, ok.

P: [reading] How successful would you say the current approach to reconstructing schools in rural areas and are there any ways that you think could improve how successful... [Reading]. I wouldn't say it's poor, I wouldn't say it's very successful, somewhere in the middle.

I: Ok.

P: successful, good, it's going slow but good, but there's plenty more room for improvement

I: Right ok. So of the challenges listed, kind of, take into account, where it might be really difficult to get materials, and it might be really difficult to get skills, which ones would you say are the bigger challenges, where they are a challenge?

P: Access, or skill.

I: Of all of those there, kind of, in the areas where they are a challenge, which ones are a bigger challenge?

P: [Reading/thinking out loud] Skill, material quality, availability , land availability. [Reading] I think access, access. People can be trained, but if it's difficult to take the materials and transportation, then it's a big challenge, from the places I've seen

I: Yeah, you can't change where it is, but you can alter the things. Ok, brilliant. Have you got any other questions?

P: No.

End of recording

G.3. High-level 3

I: Yes….So, firstly what are your roles within the organisation, just so that I can then understand the perspective you're coming from?

P: Actually, er, I am a programme operations director. Er, some of my key roles and responsibilities till now, develop planning budget for our programme

I: [agreement]

P: Er, track the implementation

I: Right

P: Er track the implementation, actually we do have the calendar, we need to track that, along with the tracking of the expenditure

I: [agreement]

P: Also, you know, in overall, you know, my role is to … supervise the implementation at the field offices

I: Right

P: We do have field offices

I: Ok

P: At different locations. So in overall, planning and budgeting, tracking the implementation, tracking and review, and monitoring

I: Right, ok. And, specifically what is the focus of this organisation, and where does that fit within kind of, Nepal's approach to school reconstruction?

P: … Actually, we work in education, so then we work with school in (?) community. We do have two different programme, one is lit, literacy program, and another is girls education programme, LP and GP in short. So, we, that means we work in school. … We work with, I mean, school in the sense, we work in the government schools, government funded schools

I: Right

P: Not in private ones

I; Yeah

P: So, … one of the goal of our literacy programme is to, you know … improve … reading habit and reading skills of children

I: Right

P: Primary grade you know. So, as per our … programme design, to achieve that goal, … we work in two different components, one is library, one is instruction

I: right

P: Of literacy instruction. So that means, to achieve that goal, you know, you need to have a good learning environment at school

I: [Agreement]

P: So to have that good learning environment, you need to have a good classrooms.

I: [Agreement]

P: so I made that is, the, you know, the theory of change of our programme design. So, that means we also work … with school in community, with the government, central level and local level

I: [Agreement]

P: to construct the classrooms. That means, the good classrooms are important and integral part of achieving our goal

I: [Agreement]

P: That's why we work, … for school construction

(Long pause) *Interruption as someone else enters room*

P2: Louise

P1: Please, have a seat. So, we know that you are coming

P2: Ok, good, Ok. Would you mind like, explaining the purpose of your study, and then, something else, because I am going to (?), so, it will make it, it will be great if you will just introduce or share, you can stop it for a while…..

End of recording 1

P: To complete, so, I'll do one, where it comes to construction and reconstruction, you know, I'll be responding to your questions, and (?) will add the value, (?) free to add please,

P2: … That's why I'm looking for some relevant question, or some specific one and all, if you already mark the classroom teaching and learning, and the management materials and method, technique, those type of things, that will be more helpful. Do you have those type of specific question or?

I: There are no specific questions asking about that, but it does ask about how the school reconstruction links with other work in communities, which would touch on some of those aspects

P: So, (?)* Nepali* Engineering background and construction and more physical things and support and creating some environment, and how really that helps given the reconstruction part is more focused look at, … but, that that is good. So, do you want to go continue, and then, please start

I: So when was this organisation established? I understand that it's not just in Nepal it's an international organisation, but did it

(Long pause) *Interruption*

P2: I will come, and then during the time, you will talk, and I will come in 10-15 minutes

I: Ok

P2: Ok, so you will finish in good time, my part will be very less in your case

I: Ok, thank you very much

P2: Sorry for that. And then I will, I do come, but you, you, I need to leave you free for half an hour at least, and then you will finish that, I will join and disturb you

I: Thank you very much

P2: You are from the, which part do you say?

I: UK

P2: no, UK, which part

I: Newcastle

P2: Ok, I did my masters from [City], so I just…

I: (Overlapping) Ah

P2: OK, see you, see you there, after half an hour maybe, sure

I: Thank you

P2: Ok, sure

I: Erm, so when did [NGO] start working within Nepal and was it before or after the earthquake?

P: Before

I: Before. And..

P: it was established in 1998 you know, as, it, interestingly, you know, the first country where it operations started was in Nepal, so Nepal was the first place of [NGO],

I: Right

P: So, currently we are working in around 15 countries, so that means it was established before the earthquake, quiet before, so quite before, so that means we started construction of classrooms, school buildings, right from the beginning

I: Right

P: So from 2002 I think, 2001, we started you know, construction of buildings

I: Ok

P: School buildings. And, about the question, has been changed focus, it, partly yes, partly no. Partly no because we have been constructing school building and classrooms

I: [Agreement]

P: Quite before, since before, since around 2000

I: [Agreement]

P: We continued that, and from, after the earthquake, our volume you know, it increased, because government wanted our support, they wanted, … the, the, the, we did an agreement with the government to construct a school building in two districts. So I mean, volume increased yes, but we haven't worked since the part

I: Ok, and that equipped you to have a lot of experience with working in those challenges, ok

P: Yeah

I: … Generally how did the earthquakes affect school infrastructure in Nepal, and do you know much about how that varied in urban areas, in rural areas?

P: … Actually, no … government has (pause), (?) 14 districts as, you know, most earthquake affected districts. In mountain, we are working in two districts

I: Right

P: In Nuwakot and Dhading, they are adjoining district of Kathmandu

I: Ok

P: Two districts. In two districts we are … constructing, we are working across 62 schools, which is massive work

I: …

P: in every school there are, three to four blocks you know, two to four blocks, in some schools five or six blocks as well

I: Right

P: so, even the number of schools, 62, but every school has two or more blocks. So, and, … and about … affects, yes, you know, 14 districts highly affected, listed (?) by the government. This constructed (?). And, what we did, you know, we did, we conduct assessment of the school in coordination with local government. So from that assessment, you know, we coordinated with central government and with local government also, so, coordinating that, coordinating there, we selected the school

I: Right

P: and then regarding affects, rural and urban, you know, its almost (?). … I will, for us, we don't know how many houses were demolished, or, proportion, but, but as for the school constructed, many of the schools affected you know, they were useless. I mean, the school came down (?), the effect of the you know earthquake, it was crack, or (?) the level of you know, for the major damage or minor damage, it was highly affected

I: Right. So you said you did those assessments, and from that you selected the schools, so what selection criteria do you use when you are choosing the schools that you work in?

P: You know, actually, you know, we have been working in Dhading, one of the districts since last 10 years. We have constructed many schools, libraries, er, many libraries. And we started in Nuwakot, er, since 2014. That means, we were working, already in those districts

I: [Agreement]

P: we knew that.

I: Right

P: Before selection, we, … prioritise those schools which were already constructed by [NGO], that was our accountability. We constructed the school, and … some of, few of them were damaged

I: [Agreement]

P: around 80% of the buildings ok, some of them were cracked

I: Right

P: So, we, one of the criteria was, to, you know, we selected those schools which we constructed, and after that, the schools selected by the government, I mean, it was a mutual agreement

I: [Agreement]. … So did you find that by having previously worked with the schools, it was easier to then, was it easier to work in the schools where you already had those links or was it a very different set of challenges?

P: Question 1 or 2?

I: Kind of question 1 to question 2.

P: Ok, … yeah, actually we had a , … to be honest we nearly worked … around, before, you know earthquake, we spent around 15 years working with schools

I: [Agreement]

P: Construction, so we did have experience, team of expert engineers

I: [Agreement]

P: So that was good part. But, after 2015 you know, the government, they developed the, I mean, building codes and (?) and designs. So, after that, you know, what we did, we all, all of the school buildings that we had been constructing, those we had constructed (?) to be (?) by the government. So from the experience, we did have the experience, now you know, we, we had reconstructing more than 500 schools, that means, we, we did have (?). With respect to, how we worked with the community, how the classroom looks like, how we coordinate with teachers, local governments, so there was not need for us…

I: And you used very similar approach before and after

P: Yeah

I: Ok. … Who's responsible for overseeing and coordinating school reconstruction in Nepal. You mentioned the NRA before…going back to the question before…

P: Are you talking about [NGO] or government coordination?

I: … A bit of both. So where does [NGO] kind of fit in within the overall organisation? Are you, you mentioned that the government had selected some of the schools that you're working with things?

P: Yeah, actually, … we, we have, … agreement with the government, we have agreement with NRA. You know NRA?

I: [Agreement]

P: We have agreement with CLPIU for the schools

I: Right

P: Two different agreements with the government, at the central level. And they do have offices at the local level as well, as well, district level. So that means …, we do have agreement at central level, we are implementing our school construction in two districts. And they do have their own, you know, offices.

I: [Agreement]

P: For them, CLPIU has offices in both districts. NRA has both the districts

I: Yeah

P: So, our field offices are engineers who work at the field, they coordinate with the C, DLPIU, that's district level

I: Right, so most of your work goes through the district

P: Yeah, NRA….

I: Ok

P: They, they, they conduct their visit to our project, provide us feedback, and already, you know, we do have engineers who are provides technical guidance, supporting, supervise school, monitor the schools, that already there…so from our organisation, our country office, we, in (?) Kathmandu office, we coordinate with central government

I: Yeah

P: and our field offices they coordinate with district client as it is

I: Right, ok. Erm, how are your projects funded?

P: … Actually, you know, our projects are funded, you know, funding is done by global office

I: right

P: Global office, that is in US, [city]. We coordinate with donors and we, some donors are individuals, some are corporates and foundations

I: right, ok. And does that mean that there are, kind of limitations or requirements that you have to stick to, to please the funders, or are you free to operate kind of, how you want?

P: I mean, support side, for example, for the actual, from the technical aspect, … we need to maintain, you know, strictly maintain the government (?) codes, building codes,

I: Yep,

P: that's very strict, government is very strict on that after the earthquake. So that is compulsory for us at the local level. At the global level, generally our global office, they, they coordinate with the donors, so our responsibility to provide them with all the data the fields, … financial data

I: [Agreement]

P: Project data, information, pictures, we provide them on field requests

I: Right

P: and also, we provide the report to the government

I: Ok. I'm aware that there are a lot of issues with corruption, kind of, various organisations, so is that something that kind of, because of your donors, you have to be extra aware of, and how do you overcome some of those challenges?

P: No, interestingly, we haven't come across that kind of, corruption,

I: Ok

P: Because we work with local community

I: Ok

P: We construct a school, we don't give money to the school

I: Right

P: we construct from our, our…

I: Right

P: So what we do, they, they, they, they form a committee, school construction committee. They will have a, you know, a bank account, a registered bank account, registered with the government

I: Yeah

P: So based on the progress, we provide them with the money

I: Right ok

P: And then, yes, our staff is always at the field site

I: Right

P: So, as of now, we haven't seen that

I: Ok

P: And for the government, we don't give any stipend? To the government, because they know that we are working for the school, we are working for the children, there is no any space for us to donate that, so it is 100% very transparent

I: Brilliant, that's very encouraging…

P: Nowhere for that, very strict

I: … Are there any ways that your program links with other work in the communities, so, kind of, particularly after the earthquake, was it possible to link the school reconstruction, to, other, kind of, the reconstruction of houses or anything like that?

P: so, from, construction aspect, or, some other program? Actually we don't, … (?) what we are doing, we construct a school building, it is ready, classroom is ready, we go to school with another programme, LP, literacy programme, and school construction, we closely work with the local community because it is community based construction.

I: Right

P: Because we are there always, 24 hours, that's a different thing, because it's a question of quality

I: [Agreement]

P: As well as financial transparency. So, once the school is completed, we go to the school with another programme, that is LP, we stay for three hours, another three years, to implement the literacy programme

I: Right

P: So one of the, one of the component of our literacy programme, seems (?) like school reconstruction, is family community engagement, we need to work with parents you know

I: Right

P: Because, parents are key stakeholder for the students learning achievement,

I: [Agreement]

P: reading skills, reading habit. And also we need to work with the community as well. So throughout, another three years after construction, we work with the local community, families and parents

I: Ok

P: So that is for LP as well

I: [Agreement]

P: And during the course of time actual work with school, from school maintenance as well

I: Right

P: We conduct maintenance with the school as well. These doors are not locking properly

I: [Agreement]

P: The window is broken. We give them feedback

I: Ok

P: And as you know, for the three years, we conduct a, annual, … data collection

I: Right

P: That is done by the construction programme. Data collection on the school buildings status

I: Ok

P: That is purely technical you know

I: Right

P: Whether the school is damaged or not, minor damage, how many cracks, in which part, pictures

I: Right ok, that's really interesting. … So, a couple of these are the technical aspects, so if you aren't aware of some of the answers, that's completely fine, … but what materials does this organisation use when reconstructing the schools?

P: … at first, you know, the buildings that we construct at the schools have been appropriately completed the design specification

I: Yes

P: Everything, the whole thing has been approved by the government

I: Yes

P: so, that means we have to two different blocks. One is four room, 2 storey, 2 storey, 4 room RCC block.

I: Right

P: And you know the RCC

I: Yes

P: Engineer. And another type of block is, 2 room and 3 room CGI block, corrugated, iron, for roof.

I: So that was 2, 2 room

P: That is 2 room and 3 room as well. So, RCC, 2 storey 4 room, 2 room at the ground floor, 2 room at the first floor

I: Ok. And, so why, do you know why you would choose between the two different ones, and where you would use RCC and where you would use the CGI sheets, and what makes those different choices

P: Now, actually it is based on the land, you know

I: Right

P: Because you know, in hilly areas there is, school has diverse type of land. So we look into the land, the soil, the foundation, and based on that, we see the number of children, and look at the number of rooms requirement

I: Ok

P: Because government has you know, already announced per child. So every child should have at least one square meter of space, that is the government

I: Right

P: That needs to be maintained. So based on all those factors we decide to go with RCC or CGI

I: Ok, so if you were building a smaller school you would use CGI?

P: Yes

I: Ok. And one metre squared per child?

P: Yes

I: Ok, …

P: And then, as you know, RCC means already concrete

I: Yep. And that would be RCC with bricks, kind of filling…

P: Yes

I: … Are those, so, those designs are standardised so you would just go to a school and go, we will use this design?

P: Yeah

I: And that would stand by your…

P: Standard design approved by the government

I: Yeah. And that's done by your engineers within the team

P: Yeah

I: Ok

P: And those schools are, you know, supervised by our engineers

I: [Agreement]

P: so we have already, have engineers for every school, for example our engineer looks after five schools, nearby in the classroom (?).

I: Ok

P: So that means, every, you know, field activity, our engineer will be in the school

I: Yes. And who actually constructs the school, you work with the community, but is that local masons, or volunteer labourers, things like that?

P: Yeah, actually you know, we, in most of the cases after earthquake you know, there was huge scarcity of masons, especially skilled masons. In Nuwakot and Dhading, you can say that, you know, it's 50, 50, 50% of them local, 50% are from other part of Nepal

I: right

P: Because of scarcity of masons, with huge construction in Nuwakot (?) And we have train, … package as well, we give training to the mason, labourers (Pause) *Interruption, phone ringing over recording* School construction, and how to manage the funds, how to keep the records, do the accountants

I: Ok

(Long Pause) *Answers phone*

I: So generally is there a lot of training required, or do most people come in with a reasonable level of skill and it's just a little bit of training?

P: It's like you, for school construction committee, that's the committee formed at the school, comprises of … members from school management committee, that's (?) and local community. And we provide them, for one day training. That is basically on project management

I: Right

P: And we provide training to the masons, both skilled and unskilled

I: Ok

P: On the construction work, you know, how to mix it, and how to measure, how to put things, materials, how to safeguard those materials

I: Right, ok

P: So, two different types of training

I: Ok

P: So, for every school, things sometimes what happens you know, masons they, we are working, support, we are constructing the school. It's a one month regular work, and if there is a one week break you know, they might leave from that place to another place

I: Right

P: Then another set of masons come, and at least you have to provide another training. That's a, that's a difficult work

I: Is it possible to, if you're working with masons on project, are you then able to use them on different projects as well, or is it, are your projects too spread out to be able to do that?

P: Yeah, there are few cases when we have done that, you know, for example, you know, there was huge construction going on, the construction was near to completion, there were some extra masons to another place where construction was going on, we have done that

I: Ok

P: But, very few

I: Right. (Pause), we've covered that next question a little bit

P: 3?

I: that was kind of talking about, kind of covered that. I loosely follow this, depending on what the direction of questions

P: Ok

I: So the next bit I would just like to talk about is the challenges the projects face

P: Ok

I: … So, on this grid I've listed some different challenges that I've seen in previous schools that I've visited or discussed with people. … So, in general for the schools that you work in, would you class these as not a challenge at all, a little challenge or a big challenge affecting your work?

P: You know what, so it's two different things material quality and material availability, …

(Pause) *Interuption from someone at door*

P: Material quality, so, … causing no challenge, so, none means no challenge, minor means minor challenge

I: [Agreement]

P: So it's different across your time you know, for example in 2015 what happened you know, soon after the earthquake you know, there was economic blockade from India, for almost 6 months, and there was huge scarce of everything in Nepal, because we were in huge … (?). Building all were demolished, people were the (?), there were no water, I mean, that was a horrible situation. If you will come in here, I will be, at the age of 80 I will recall that moment and be scared. So at that point of time, for almost 1 year, and since then, there was such scarcity of material….

I: (Overlapping) Right

P: …available to us. And now, there is no scarce, but, yes, cement no problem, but there is problem with sand and boulders

I: With the sand and the boulders, they, mostly be sourced locally or would you have to be buying them in?

P: Usually it was locally you know, but ...

I: (Overlapping) Right

P: …government has blocked you know. They have closed the process, process you know, means the machine they put at the, at the, … at the base of river

I: Right

P: and they you know, crush the stones, and they stop that because of you know, encroachment of environment (?). But since then it has been different you know, we have been, … collecting those items from nearby our districts, because at that cost, has increased to be honest

I: Right, ok

P: So, for me, it has been difficult you know, because it, material quality and availability has been different across the period of time …

I: (overlapping) Right

P: … so as a whole, in total it is minor

I: Right

P: You may appraise, it depends on time (?). … Skill, skill of labour, … skill of labour is a, availability is a major problem, skill is a minor problem, I don't know how to rate that

I: I will note them both

P: You know, because of, why, environmental (?) problem, because we are working in two districts for, there was a major effect of earthquake, so huge construction work going on because of massive construction on work, everyone in the district, scarcity of labour.

I: Yes

P: Accessibility and transportation, it is a major problem, because of landscape, hills, mountains, temporary roads, no roads, you know, bumpy roads.

I: Yep

P: It's very costly. It is difficult you know, deliver the materials to the school

I: Right

P: Very difficult location. Ah, government process…if you ask me, compared to the past, it will, … better, yes

I: Ok

P: Because new generations are (?) the government as well. As a whole, … it's not a major, <u>minor</u>.

I: Right

P: Not a no.

I: Do you find that because you have those standardised designs, it's a quicker process to get approvals and things

P: It took us really long time

I: Right

P: From there to there, then to there and then to there, and moving from one office to another office, very takes time, the only problem is time consuming.

I: [Agreement] But now that you've got those designs approved, is it easier to go through that process, or do you still need to go through that every time for each school?

P: Actually what happens is, our design has been approved

I: [Agreement]

P: And generally we have to do, you know, agreements with them

I: Right

P: So after completion of agreement, you need another one or two months to have you know, another agreement

I: Right

P: Because of long process. Time, they want to reach the school, see everything, they want pictures, the data, and that's good.

I: Yes

P: in every drawing, at field office, at that time. Takes time, in overall it's time consuming

I: [Agreement] ok.

P: I mean, there is no any other, you know, common, like, corruption like, we have not faced that at all

I: Right

P: We should be honest

I: Ok

P: It's only a lengthy process

I: Right. Have you had problems with community involvement, some, from the projects I've seen, some have a really positive, and supportive experience with the community, whereas some, it's caused lots of delays and lots of challenges

P: No, we don't have problems with the local community, because they want the school building for the children

I: Right

P: It's positive. Only the problem is you know, the payments, who supplies the material to the school on time.

I: Right

P: So overall community involvement is not a problem for us

I: Right, ok

P: Because we are working with the community since long time

I: [Agreement]

P: We know how to work with them, how to please them. I will need to (?) at the end, (?) according to it, they have been trained on mobilising the community, and so no problem for us. Quite happy with the community

I: So what sort of steps are they, that you take to better work with communities

P: Yeah, actually you know, we, don't directly talk with any school, you know, we start from community engagement

I: Right

P: I will, the first time we visit, the school, we organise a meeting with school management team, the next time with school management committee and the community and the parents

I: [Agreement]

P: and we discuss there about our project, 'this is what's going on, this is the amount, this is the whole project, total cost is like this'

I: Ok

P: So everyone provide, we, we, we, … discuss to the local community about expenditure, … the financial data, it's very public orientated, you know

I: Yeah

P: Transparency. So, no problem. Land availability, (Pause) it's a problem

I: Right

P: To be honest, it's a problem. Especially in the hilly areas. Mostly, you know, earthquake affected districts are hilly areas, so, in overall it's, if you had given in scale, I could have you know like, 1 to 5, probably would have been more easier, 3 it's just, …

I: What would you rank it out one to five?

P: Out of three, five?

I: [Agreement]

P: Four

I: Four? Ok. Is that due to the land that the, your, are you rebuilding on the existing site or do you have to move site, is it poor quality land, or is it just hard to access and things like that?

P: … In most of the cases, the most appropriate thing is you know, the land, I mean, we don't construct a school where, simply the school management shows you, 'ok this is our land, you know, we have identified that', land belongs to school or not, or is property of government, if license (?) is there or not. So in most of the cases what happens is, in rural community, what happens you know, … generally a school doesn't get the lands which are, … farming, suitable for farming, which are for settlement, they usually get those which are not, almost useless, you know, that's for the school. It's like, a, a slope, … like a hill area, and it is real work for planning. Sometimes a very small area for the school design, (?). Most of the (?) of the schools.

I: Ok. Brilliant. Are there any other challenges that I haven't mentioned, that you've faced, or is that a fairly comprehensive list?

P: Challenges, number 1, er, availability of the material on time. Village construction is very, very difficult to supply the material to the school, no

I: [Agreement]

P: We can't put any stuff like this

I: yeah

P: and that’s also very difficult, they also don’t have space, safe space. I mean, of the materials

I: Yep

P: storage I mean. Two ways they deliver their materials, they live (?) to more than difficult locations around here, the road which is not available throughout the year

I: [Agreement]

P: So they can’t work from in rainy season, which starts from June to September

I: [Agreement]

P: so these four, five months you can’t work, almost there is no work

I: So do you just avoid kind of, process, starting projects that would run over that time?

P: Yeah

I: Right

P: As much as possible for us

I: Ok

P: It doesn’t mean that everything will stop, but the risk is, progress will be very small you know, at that time. … Second is delivery, third is availability of the mason, I mean, we are talking about our challenges, oh. All the challenges, loss of materials, during delivery

I: Right

P: That, that, that has a cost. And third…

I: (Overlapping) Is that due to them being damaged on route, or …

P: (Overlapping) Because of damage of road, you know

I: Right

P: Bricks broken you know, sand you know, spills somewhere

I: Right

P: That’s a loss. Lots of the challenges aren’t in the structure, like you know, you go to school, and you come up with a, come up with an idea, design number of students, they need 4 rooms, 6 rooms, so, put one block here, one block here

I: [Agreement]

P: Later on, second time, third time you’ll go to the school then found that, they need some cost for that, you know, to make that, … what do you call technically, … if the slope is like this, if not to construct here you need a retaining wall, something like

I: Yes, retaining wall. Right

P: And the school doesn’t have water from, how to know how to literate (?)

I: Right

P: So, some of the things are unanticipated and that increases the cost

I: Right, ok

P: Water source supply, because of land you know, retaining wall, other forms of…

I: Right. And then, you've mentioned a couple as we've been talking, but are there any actions that you are aware of to overcome some of the challenges, or to, … decrease the challenge, to avoid them completely? So you mentioned not working during the monsoon, … and that good experience of working with the community.

P: Actually you know, I will have to show you this, there are several challenges that we had to work on, because, you know, they were wasting (?) our time. For, for the masons you know, the children (?), we were constructing many schools, we need masons and they are dealing with worker. So if they don't get work for one or two days they migrate. Yeah, we engage them, we have to pay them. So what we did, you know, we were constructing at these school for a time, school A, and if the school gets a short supply of materials, generally we transfer these to another school, to engage them

I: Ok

P: So that, they don't leave (?) it… Second was you know, material delivery, we go to a public building, for example a bidder, you know, from Kathmandu

I: Right

P: Is awarded, competitive process. It will be like, you know, the vendor from Kathmandu, they have to supply materials to different schools

I: [Agreement]

P: They share this to get quota (?) from Kathmandu, to dissipate quota (?) to different schools,

I: Right

P: That's very difficult you know, what we did you know, we hired a small warehouse

I: right

P: And used this as headquarters, supply, supply, supply here,

I: Right ok

P: For some while, and from there to school, you know. We broke the chain you know, supply chain

I: Oh, brilliant

P: We develop the supply chain for that. And, one of the difficult part was the school construction making. Then what we do you know, we not only constructing school, classrooms, we also provided classroom furniture

I: Right

P: One of the difficult part was the quality of the furniture at the local level. For couple of schools, we came to know that the quality of the furniture at the local level was not good, so we change the agreement with school. It was difficult however, but it was for the children

I: Yeah

P: we bought those furniture at Kathmandu and deliver to the school

I: Right, ok. That's, that's, I really like that concept of going to a warehouse

P: Yeah

I: Kind of, taking ownership of that more. Oh right, brilliant. My last question would be, how successful would you say your current approach to reconstructing schools is, and are there ways that you think that could be improved, or are there ways that you have improved kind of, within the process so far?

P: Er, actually, before the earthquake our construction, no, no approvals, bit different, we worked in a 'challenge, grant model'. So 'challenge, grant model' was like you know, we used to discuss with the community and we used to ask them, 'ok, you need 6 more school building, this cost, cost this much of amount, suppose 100, Ok, we'll give you 65'

I: Right

P: 'Can you manage 35, and how?'

I: Right

P: We used to call that challenge, grant model. We used to give a challenge to the local community, we give this much, can you manage this much, but how? And this took local raise the fund. I mean, that was one of the model that used to work in, first.

I: Right

P: But after the reconstruction, you know, earthquake. Government has a circular (?) , so based on the government circular (?), we can't raise fund from the local community, it's 100%.

I: Right

P: I mean, if you ask us, which is the good model for us, then we will say, this, the old one, 75 25 model

I: Right

P: Because that, because of this one, you know, that develops the ownership you know

I: right

P: of the local community. … So we say that, you know, we are happy with our current model, we will have to go, but …, after the, you know, after 2019 we would like to, you know …, we'll be closing our reconstruction project

I: Right. Because that challenge grant approach might then work, as you move into, or kind of, as the country move the focus to western Nepal, where it's..?

P: No, actually it's, it's high level risk you know, [NGO]. In future, [NGO] only would like to work in LP to support and encourage education programme, not in school building

I: You're going to move away from construction?

P: Yeah

I: Right, ok.

P: One more way to improve you know, you need to have, a holding (?) house at the district headquarter. Because you know, supplying the materials from Kathmandu, all the way to different schools at the - one where is not possible. We need to develop supply chain mechanism that was our learning.

I: Yeah. I haven't come across anybody who's done that yet, so that's a really interesting point for me to look at

P: Yeah, and one of the challenges, you know, is, if you send (?) the school at different geography you know, widely spread, that will be difficult, you'll have difficulty in engaging the local masons. Once they are free they will migrate, so having two or three schools nearby will be very helpful in engaging them when they are free.

I: Yeah

P: …

I: That was something that I was hoping to see happening, so that's really encouraging that that is taking place

P: You know, three schools here, three schools here, three schools here, will be easier to manage

I: yeah

P: then also easier for monitoring as well

I: Yeah, it means that your site engineers have less to travel

P: Local cost, distance cost (?)

I: Awesome, thank you so much

P: Thank you

G.4. High-level 4

[Background noise]

I: Um, so what is your role within the [Organisation]?

P: Ok, I am civil engineer, I am looking after, … in overall school reconstruction damage by the 2015 Gorkha earthquake in Nepal. And we are mandated for school reconstruction within 31 districts.

I: right

P: … And within, … my organisation I am specifically focussed on, … school reconstruction, … with support from Asian Development Bank

I: Ok

P: together with this, I am also looking after school reconstruction through school management committee. Specifically we have three modalities of school reconstruction. One is, … mobilising school management committee, directly they are, … responsible for overall construction management and technical backstopping and oversight roles are done by our organisation at the district level. We have engineers, sub-engineers who will, who will support them in technical matters, but overall the construction management is being carried out by school management committee, and about 75% of the schools that are damaged by the earthquake, … will be covered by this modality of the school reconstruction

I: Ok

P: The second modality is, … school reconstruction, … with philanthropic organisation. We do, … accept, … proposals from the philanthropic organisations or even the individuals. Then, then, … we, … in general, monitor their construction activities in the field, but the day-to-day supervision, and all quality issues, financial support and everything will be born by them. NGO, INGO, persons, … philanthropic, humanitarian partners, who are, … to whom we have made MOU. We have made tripartite MOU, one with NRA, one with, with, … one partner is CLPIU, and other is partner organisation.

I: Ok

P: About 15% of the schools, … in, … will be covered by this modality

I: Right

P: In this modality, either they choose to hire a contractor, from their side, or they, … they engage community, or, it’s up to them

I: Yep

P: Ok. And the third modality that we taking place is, we are hiring professional contractors, … to construct, … to reconstruct schools. … This is basically based on the G2G agreement, or multilateral bank assistance, like JICA loan, and ADB loan, or grant, USAID or whatever. It depends on the loan or grant agreement and it is stipulated over there.

I: right

P: Their implementation modality. And … basically we are doing, … this way in the school reconstruction.

I: Ok, … how much of that is within rural areas, or urban areas? Does that split change depending?

P: Yeah, yeah, basically, … more focussed is on the 14 most affected districts that are in the hilly areas of Nepal, including there are three districts within Kathmandu Valley.

I: right

P: The urban centre. In our context of Nepal, urban centres are called those areas which are covered (?) municipality, that is why it is quite difficult for you from the, … saying that it is from the urban centres. Some have the nature of very rural, but they are, you know, designated here as urban

I: Yes

P: Because it falls, falls under the jurisdiction of municipality.

I: Yes

P: That's why, I don't have exact data of that, you need to look after the data

I: Ok

P: Basically, most of the schools are damaged, … by this earthquake, in hilly areas and in the rural-urban, rural settings.

I: Ok. (Pause) And the CLPIU…

P: (Overlapping) Yes

I: Was set up after the earthquake?

P: Yes

I: Through the NRA?

P: … Yeah, it is, … established, after the earthquake there was a discussion, how to carry out the reconstruction in all, in Nepal. And er, NRA was established, … then after NRA, the CLPIU was established under Ministry of Education, for school reconstruction.

I: Right

P: After the organisation change in the last (?), … last April, it was directly under NRA. Earlier it was within Ministry of Education, but now it is under NRA.

I: Right ok. And you mentioned that most of the schools that were damaged were in the rural areas?

P: Yeah

I: Was there a particular difference in how they were damaged, were, and how the affects were different in rural and urban areas?

P: Yes, yeah, these is very important questions, because most of the schools in rural areas were constructed using, … mud mortar

I: [Agreement]

P: They might have, some might have, … steel frame, but the infill wall was, … with mud mortar

I: Right

P: And due to this inconsistency in materials

I: [Agreement]

P: Properties. Most of the frame and covering remained intact while the wall was damaged, collapsed

I: Right

P: Because there was no structural integrity between steel column and the wall itself.

I: [Agreement]

P: … And in the urban settings, … some of the schools … majority of the schools in the urban areas were constructed using cement, and RCC frame, and … they are survived in urban areas.

I: [Agreement]

P: But we are a bit wondering that, … overall, this, … what do you call, ground shaking in Kathmandu Valley is not that much what was anticipated, that was according to the geologist

I: Yes

P: Yeah, the geologist expected that, predicted that, … it will be in the, … ground motion will be in the range, … 0.4 to 0.5 or something like that, g, of g. But …, some are claiming that, I'm not quite sure, but it is within less than 0.2g, that's why many of the er, schools survived in Kathmandu Valley

I: Right. Because I'd followed a bit of the, … retrofitting programmes that NSET had been

P: [Agreement]

I: overseeing, and things like that as well, which seemed most focussed in Kathmandu

P: Yes

I: And all of those schools survived?

P: Yes, yes.

(Long pause) *Interruption*

P: Ok, please.

I: So, the CLPIU, are they responsible for overseeing, coordinating all of the school reconstruction…

P: [Agreement]

I: Whether that's then in the three different, … modes

P: Sorry?

I: So the CLPIU is responsible for overseeing all of the school reconstruction…

P: Yes, yes, yes

I: And that would be through the three different

P: Modalities, yes

I: Yes. … And how does the process of identifying and initiating those projects work?

P: [Agreement]

I: So, how do the individual schools get identified and selected to be rebuilt…

P: yes

I: And does that differ in rural and urban areas?

P: Yeah, yeah, yeah, yeah, that's …, what we are doing, … after the earthquake we, … we have a SIDA with the World Bank, and they are willing to support us, and they asked us, what, 'what is your priority needs?', and we requested them to first of all, to do the survey, because we don't have data at that time. And through the World Bank support, we get … SIDA, support for SIDA yeah.

I: Yeah

P: From that, we are taking the, … (?) and from our local level offices, … from the district levels, … we are … selecting the schools. Basically, the overall idea is, the damage is, … status of damage and then the possibility of the merger of the schools due to the less number of students basically in the primary level

I: Right

P: And then, another thing is that, … the, … number of students enrolled in these schools, we are targeting basically, those schools which are highly damaged in the earthquake, and having the greater number of the kids

I: Right. (Pause). And then, when each of the different modalities is chosen, is that mostly you saying to an organisation 'you need to go and rebuild that school'…

P: Yes

I: …Or does that organisation come to you and go 'we're working in this area…'

P: Yes

I: '…We'll rebuild this school'

P: Thank you, I have, what, there are, we give them the choices to the, … partner organisation, usually to choose the schools. But the basic question is whether it has been recommended by our district level organisation or not

I: Right

P: They will recommend whether it needs reconstruction or not, whether it will be continue, … within merging

I: Ok

P: with another school, nearby schools or not. There are some criteria we have instructed them to follow

I: [Agreement]

P: And based on their recommendations we are doing tripartite MOU with the partner organisation. But what we are seeing, those organisations as well (?) concentrate in one areas, don't … scattered the programmes in the various locations, so that, so that your recognition supervision, monitoring, and … etc. will be visible more, and in a comprehensive way

I: Yes

P: And if you are doing, … fantastic job, then you will be praised by the communities. If you are not doing a good job then you will be, maybe blamed as well. That's why we asked the partner organisation to choose the area, but within scattering in the different locations.

I: Right, … and all of that funding comes through either you, or the ADB, or the JICA or things like that?

P: Yes, yeah. Those fundings that Government of Nepal is getting from the loan or grant amount. That, there is a condition that, … these schools reconstruction, should be taken place by the, hiring professional contractors through competitive bidding process, through tendering, you know?

I: Right

P: (?) What we are doing, we are taking schools, having greater damage, with the greater number of students enrolment, for the, in inaccessible areas, because we cannot transport materials, equipments, … to, for reconstruction, yeah. Regarding those schools, using, with mobilising school management committee, number one, we have limit of 20million Nepali rupees. Less than that, we can mobilise the school management committee

I: Right

P: Above that, we cannot use them.

I: Right

P: Because they don't have that much capacity, equipment. There is … ceiling, for, … school management committee. That's why small schools, where, requirements is less, we are mobilising the school management committee and the fund is from government of Nepal internal resource, it's not from the loan or from the grant, yeah?

I: Right. And would you say that that generally is different from the rural to the urban areas?

P: [Agreement]

I: Because from the case studies I've visited, which might be that I've just visited a select few, the ones in Kathmandu have been government funded, whereas the rural ones have been through partner organisation

P: [Agreement]

I: Is that, is the government funding generally in the urban areas?

P: … Yeah, that depends, basically, this depends on the requirements, their requirements. If their requirements is less and we can cover that from the government funding

I: Right

P: Then we will not request for, … for the, … we are not going to utilise from the loan or grant money

I: Right, ok. … And another area I'm particularly interested in is looking at how, by rebuilding a school, you can then also link that to housing reconstruction and things like that

P: [Agreement]

I: and I understand that the funding comes from different places

P: [Agreement]

I: and it's different implementing units

P: yes

I: but I've also seen a couple of really good projects where, by rebuilding a school, the community have seen that and then taken on those technologies…

P: [Agreement]

I: So are you aware of that happening very much, or trying to encourage that?

P: There is no direct link

I: right

P: But, there are indirect link as well, for example, … housing reconstruction programme is giving masons training, training for masons, those masons are also, … doing school reconstruction as well

I: [Agreement]

P: And another thing as well is that, we are hiring professional contractors for rebuilding schools in, … accessible areas, but that are also in the rural settings. The overall idea is that, to hire the professional contractor is for technology transfer, technology transfer. There, the idea is that, they will bring the, … equipment, they will bring the skilled labours from the different parts of the world, and they will be receiving supervision from engineers. That's why, as school is a learning centres, the builders as, they can learn how to rebuild, how to bend a bar, how to do curing, or something else. This is also, this strategy idea, to … make few of the schools utilising, using, hiring professional contractors.

I: Ok. And has that been successful from what you've seen, where that does happen, or is that hard to set up

P: Yeah, I think it is your job now to assess.

I: Ok

P: we are implementing, yeah, … and this I think, the third, I, they should, … look, and assess and do research in this area

I: I'll get back to you. And then I have a few questions about the materials that you recommend

P: [Agreement]

I: So is there specific, I've seen a few designs on your website that are recommended

P: Yeah

I: … Is that all the same materials, or do you recommend different…

P: Different, we have, we have a lot of different materials, that suits the different context, yeah. … But basically, after this 2015 earthquake, it is not allowed to use mud as a, … binding materials

I: Right

P: We are using, … many type designs, and site specific designs, that complies Nepal national building code. We are following Nepal national building code.

I: [Agreement]. So, is that, I've seen some compressed earth brick schools, and an earth bag schools…

P: yeah, yeah

I: And, then a lot of RC and fired brick. … Infill walls and things. So, but I hadn't seen designs for the CSEB and earth bags, so…

P: No, infill can be used as CSEB can be used, unless, until it is, you know, it doesn't have required compressive strength of the bricks. But regarding the earth bags, as schools has an high importance factors, and enrolled, … if there is some casualty, calamity there will be much destruction of. That's why, in schools we are not accepting earth bags

I: Right

P: … We have … some, … some of the partner organisation have submitted us the designs, but we … studied that, and the structural engineers, they said that, … it will not survive at the, you know, in the overturning moment. That's why they used steel rebars, and … we asked how it will be compatible with the earth. Steel rebars is not compatible with the earth, and the life of those, that's why it will rusted, you need some cover, and this cannot be, …. It can be for academic research, but we cannot implement for school reconstruction (?)

I: Yeah

P: That's why we haven't, we haven't accepted earth bags

I: Right. So would you say most of the schools that have been rebuilt so far have been RC, and fired brick?

P: Yeah,

I: And then, what…

P: CSEB also, we have used CSEB also, … there are some, you know this is taking place yeah, but the, for CSEB, you know they have a good combination of sand and soil, composition. Which is mostly not available in the case of, … Nepal.

I: Right

P: If you want to mix sand, it will be much more costly in the hilly area, because sand is available in the river bed

I: Right

P: And you have to transport to the hill top from the river bed. That is quite costly, that's why, … instead of CSEB, it will be you know, cheaper, using, … natural stones

I: Right

P: or fired bricks

I: Yeah. And for the stones, do you know how often they are just used as they are…

P: No, no no, no

I: … or do they get dressed very often?

P: Yeah, yeah. We cannot say it is dressed stone perfectly, but is hammer dressed. At least it should bring in some, in a regular possible shape. We cannot use random rubble stones, yeah. If we use random rubble stones, … using, … cement mortar with that, it will not be that much problem I think, if we use seismic elements, like, … sill bands, lintel bands, … and, … you know, bands in the sides of openings.

I: Ok. And, who generally is involved in designing the schools?

P: Yeah. We have hired … engineering firms as well. Some of the partner organisation are proposing from their side

I: right

P: But, whoever designs, that, … even, … some of the international expert are designing these schools. But what we are looking after, it should comply Nepal National Building Code. And, the designers should have the professional experience and registered in Nepal engineering council

I: Right

P: This is the regulating body to regulate, …

I: Right, ok

P: … the engineering services

I: Yeah. So you generally, those people would have good experience, good skills

P: Yes, … we also do peer review here. We will ask them to present, your design philosophy, how you are coming up, even in our, … Department of Urban Development and Building Construction…

I: [Agreement]

P: Is one unit, … who are, … responsible for approving those designs

I: Right

P: they will ask their designs, even in soft copy, and they will go through it, and any comments, they will make, provide feedback

I: Right

P: And after incorporating those comments, only, we approve the designs, and those approved designs will be implemented at the field level

I: right, ok. … And then, just a few questions about the challenges..

P: [Agreement]

I: So, from some of the case studies that I've seen, I've identified a few different challenges…

P: [Agreement]

I: So, from your perspective, how, would you rate them as either 'not a challenge at all', a little challenge or a big challenge? … So firstly, the material quality and the material availability?

P: [Agreement] yeah, we don't have many options for walls

I: right

P: We don't have many options for walling material.

I: [Agreement]

P: That is the main challenge. If we use stone, the deadload is coming very high and the structure is going to be heavy

I: [Agreement]

P: Yeah? We don't have many options for materials

I: And is that probably, is that one of the bigger challenges?

P: [Agreement] the most challenge, the bigger challenge is the suitability of the land

I: Right

P: And our geography. Our geography is, … you know, our mountains are very young, and the geological formation is very fragile, and we don't have, we are making the building, schools, on donated piece of land, which we are not buying. It is donated land and … the donated land is not always suitable for school construction. They are in the different terraces

I: [Agreement]

P: Yeah. And with er the very steep contour, steep hill slopes which are vulnerable to landslides

I: Right. And the availability of and the skills of the actual labourers and the people doing the work?

P: Yes, yes, yes, the, … the earthquake resistance technology, the rebuilding, … the structures with earthquake resistance technology is, … you know it is increasing day by day, but we don't have that much perfect, … that much perfection. Because you know, in your country, like, there are, (??) Peoples who do not have professional experience, even in trimming here, they're not allowed to do their business. But here, we don't have any of this. For example, a plumber, you need a license to do plumbing work, but here, people, illiterate people, are having visual inspection and their own experience through their own learning, they are doing this job

I: Yes. Especially for communities in rural areas

P: Yes, yes, that's why you cannot expect that, you know

I: Yeah

P: The workmanship, the good workmanship from those level of people who are not capacitated to do so

I: Yeah

P: That's the thing of, you know, developing nations like this.

I: Have you seen much of, cause I know that, … the government, or government people go and … do supervision and do checks and there will be engineers or contractors doing checks

P: [Agreement]

I: But do you know how much kind of changes need to be made or improvements need to be made?

P: Yes, we have this, we are, … continuously doing this, … after the earthquake we have, … we have you know, … reviewed our school construction activities that were done prior to the earthquake. We look at our design.

I: [Agreement]

P: We updated our design. There are some issues of, you know, integrity of infill wall with the column or the main, … you know, load bearing elements. That's why we enhance that

I: Right

P: And then we see the grant amount, how much we are giving to the communities. That was very less. And, what we, … said that, quality will be compromised with them given money, that's why we

… you know, we raised, we provide whatever is needed. That much money we are providing after the earthquake. And we are not expecting, … (?) contribution from the community, because those people are also homeless. We cannot expect, … their contribution in (?). And the third thing is that, we increase the number of engineers and sub engineers, to, for technical support, because, due to the, … you know, … very less supervision, things are going wrong.

I: …

P: Things are not on track. Construction is not as per design and drawings. The local people are not able to read, … the drawings, and the technology. That's why we increase the number of…

I: Right

P: …the number of engineers as well.

I: Right. Ok. … things like accessibility and transportation.

P: Yeah, it is a big challenge, especially in the mountain

I: Right

P: Even in some of the parts, … in the, … winter (?). There is nowhere near means of, … vehicular transportation. We have to rely on either the mule, or … the donkeys, or … in the hay load. That's quite difficult for transporting the rebars

I: Within the government processes itself, so some people reported that, kind of, going to the person, getting approvals, things like that, was causing delays, or is it just because that takes a long time?

P: It is because, the people, … many of them, do not know our process. Why is this mechanism has been established? Because to ensure the, … design is up to that standard

I: Yes definitely

P: But people don't know, and they want to rebuild schools, … right from, … immediately. But, they have to follow some of the design guidelines

I: Yes

P: And it has to be approved

I: Yes

P: Because it is a school, we cannot, even in the private housing, the government is enforcing this code, code of compliance, building code compliance. That's why, yes, some are saying like that, but it is that, if the design and the, … standards are, … as per the Nepal building code, there will not be that much problem…

I: Ok

P: But, if the given design is not competent, and it is not as per the code or requirement, then yeah, it will take time

I: Ok

P: It depends on the know how of the, our code, our…..

I: Yeah

P: That's the thing.

I: as a kind of side line to that, is this mostly for public schools, and then private schools, do they still need to come to you, or is that entirely separate?

P: Yeah, … private schools we are unable to regulate so far for private schools. But we are, you know, this, through the municipalities. Municipalities are responsible for approving the, … you know, … giving, … building permit

I: Right

P: But, you know, in our case, some of the municipalities, they don't have this professional experience, and they are also, … due to this (?) structure, recently, … enforced Nepal, they are also, not … capacitated to enforce.

I: ok. And then, … the community being involved in the projects

P: [Agreement]

I: can both be a really positive thing, but can also be a challenge, kind of similar to the labour I guess

P: Yes, community, community is a …

I: (Overlapping) Is a?

P: Is a very big, big …, community, they are very, there are interest groups as well. There are (?) politically divided, and this is, they have, they are also personally interested in some cases, and some are very supportive. That's why, … it should be just be in case by case basis, we cannot generalise these terms. And the community (?) for me, is very big

I: Yeah. Ok.

P: But most of them are because, the communities are requirement, and they are supportive. But, the quality of, … public schools, government schools, is you know, questioned (?) at the level of primary, in the primary level. That's why many of them are sending their kids to the, … private schools. Then, then, why should they worried more about the community schools at that level. That's why, that is the thing.

I: … and are there any other challenges, that I haven't mentioned, that you think are a challenge to how schools are rebuilt?

P: … The challenge is that, … you know, … translating the designs into the field level

I: Right

P: Because, the paper designs should be truly translated into the, … field level

I: [Agreement]

P: This is due to the quality of materials, workmanship, level of knowledge of the engineers, and the, … there are number of engineers, they have to look after many schools, yes. Because we are constructing schools in the massive scale

I: Yes

P: We were not, you know, we were not, you know, … prepared to do so. That's why disaster risk management, and this reconstruction, was not our, and, the other challenge is that, mass reconstruction is taking place in private sector as well, private housing, and there is scarcity of the labour

I: Yeah

P: And materials in some cases.

I: … and so you mentioned a few things about how the process had changed…

(Pause) *Interruption*

P: Ok..

I: So you mentioned a few changes, you know changing the design, and how much money is given to communities. Are there any other actions that you're aware of, that overcome, or decrease any of the challenges….

P: [Agreement]

I: …that we've mentioned, and what are they?

P: Reconstruction is the mandate of the NRA, this has not been, this has not been decentralised due to the local structure, are simply established and newly elected, … and the peoples representatives are in place now. But they don't have their own organisational set up, they don't have this, and that's why, … there are lot of coordination challenges.

I: right

P: yeah, … because there is, … there is newly enacted constitution and local election, and … those are some of the challenges. If you truly able to translate, decentralise these things to the local level, then it will, work better, but, … they are like, infant, they can, the local level is like infant

I: right

P: They don't have resources.

(Pause) *interruption*

I: Have you found that the move to the DLPIUs working within the CLPIU has helped that?

P: Yeah, yeah, we are working closely with them

I: Right

P: DLPIU. They are extended arm of … CLPIU

I: Yes, ok. And then, my last question is, how successful would you say the current approach to reconstructing schools is, and are there ways, you've mentioned a couple, but are there ways you think that could be improved?

P: Yeah, already told you that, … if we have strong local government, then it will, it would have been very easy, to recover all the things, and the reconstruction. But we don't have that, and we cannot expect it at this moment as well

I: Yes

P: And even in, near, future, or 5 or 10 years also, it will take time

I: Yes

P: Gradually it will happen but we cannot expect, because the local government, they don't have this capacity and resources, that's why, … for this moment, I think, this approach, what we are adopting, … is, the best approach…

I: Ok.

P: What I can say. But you should ask this question to the schools and the local communities, 'is this the right approach of the CLPIU, or is this taking place or not?'. This will be relevant question for them, not for me.

I: Yes, yes that's kind of what I'm hoping to understand, is trying to understand the different viewpoints, and what is happening from kind of the different sides of it. … And then not just looking at, because by the time my PhD is finished, I will be, the reconstruction, there will still be lots to do, but a lot of that work will have been completed, so it is looking forwards, and how we can extend that to improving schools in, say, Western Nepal,

P: Yes

I: and kind of preparing guidelines, potentially

P: Yes, for the forthcoming natural disasters, yes

I: Definitely. And what lessons we can learn from Nepal

P: Other countries

I: to apply in other countries

P: Yes, you cannot generalise but it will be, … lesson

I: Yes, and one of the things I'm hoping to produce is a map of the different technologies are best suited, because, from what I've seen, a partner organisation will advocate for a technology, so say they work in CSEB

P: Yeah

I: And therefore they will do that in whatever community they work in

P: Yeah

I: Even if maybe it would be better in a different material, so trying….

P: Yeah, you should be, … one thing, all these case, contact, CSEB, we cannot generalise, I have done research for CSEB to promote in 10 different schools. I collected soil samples from 10 different areas, but none of them were, you know, … economically viable.

I: Right

P: Only 2 of them I can add up to 8% of cement, adding of the 8% cement, that is viable

I: right

P: That's why, we need to look after all these things, we cannot simply say this is good, or this is not good, one should be, very you know, (?) with CSEB, think, what you are considering for. If it is private house, the earth bag may be appropriate technology

I: Yes

P: That we are utilising since long, this earth bag, it is nothing new in Nepal. You may perhaps know that the sentry post for the security, they are using the sand bags, because they have heard that, well proposed, one is if that if someone fires, it has protection, and it will not harm the guard, and as well it is environmentally friendly. It will not hurt and it will be … we should think about these, … you know, scaling of any technology, you should, belt in more (?). Yeah

I: Yeah, it's been promising so far, because one of the things we were expecting to see is that, the western world

P: yes, they want to promote something like that, and it may not be appropriate here. It, appropriate technology, it should have social dimension, environment, culture. One thing is that, what I would say you, we need to discuss a lot about the developing world, and the developed world, there is the difference in the brown agenda or the green agenda, which one comes first, you know about this? The brown and the green?

I: Yes, the argument about sustainability

P: Yeah, what is our, … priority needs, is this the, … you know clean energy, or something else, or is this, what facility we need first?

I: Yes

P: That is the debate

I: Yes

P: we cannot discuss at this moment the climate change issue in Nepal. What I feel a bit, you know, … uncomfortable to discuss with climate change in Nepal. We are not contributing for any carbon emission or something else.

I: And what, …

P: This is the time for us to discuss about the brown agenda, not the green one

I: Yes, and the western world were able to develop with out those consideration

P: Yeah, yeah, they need to talk about this climate change. Here it is affecting us as well, it is not the translation of the, this is the original, is, it's not the local issue, but, … yeah, we need to discuss about this.

I: Ok. Thank you very much for all of that, it's incredibly helpful

P: Yes, thank you so much for considering me, it will be great opportunity for me if you can share with me your findings.

I: Yes

P: I am not sure if it's possible for you to share your thesis, but it will be nice opportunity for me to also read.

I: Yeah, so after this visit, I will be putting together a sort of, short, summary report of what I have found from this trip

P: Yeah, field visit

I: which I can share, and then, also, in some couple of years, when my thesis is done, we can be able to share that as well

P: Thank you

I: It will be, because also, what we were concerned about, we don't want this to be, me sitting in my office in England, oh yes, this is what Nepal needs to do and that not having any links, and that not being transferrable. So actually having that going to you, and even you seeing kind of draft guidelines and things that I produce and getting your comments would be really really helpful

P: Yes

(Pause) *Interruption*

I: Erm, yeah, have you got any other questions for me?

P: No, if you will share with me, that will be great

I: Perfect

P: And I wish you all the best for your completion of the research.

End of interview

G.5. Case-specific 1

I: So, the name of the school is [School]?

P: [School]

I: And how many students and staff are there at the school?

P: 60, 60 students

T: 60 Students

P: 60 students. Ladies and girls also. Now, I have sourced 4, 5 teachers

I: And are there-?

P: (overlapping) (?) volunteer teacher, (?)

I: So 5 in total

P: Has *Nepali* [yes]

I: Ok. How many classes are you, do you have 5 classes?

P: No, four class

I: 4 classes. And what age are the students?

P: Age?

I: How old are the students?

P: Students? Total? How many?

I: How old?

T: *Nepali*

P: How old – how old, 20, er, 4, 5, 4, 5 years, also 20

T: *Nepali*

P: *Nepali*

T: Some 4 to 20

I: Age 4 – 20?

T: Age 4 to 20

P: *Nepali* 4 years

T: 4 to 20

I: Is that ECD?

P: ECD yes

I: Up to 20? Is that class 12?

P: No, no, no, no just 4 class

I: Right

P: Because here deaf school opening just two years ago

T: It might be they haven't been to school

P1: *Nepali*

P2: *Nepali*

T: It's been four years that the school has been registered. There was no school for the deaf, that's why they couldn't read. So at the age of 20, they have training.

P: *Nepali*

T: That's why they are training.

I: In the, you've been reconstructed. What organisations were involved in helping to reconstruct the school?

P: This building, [NGO] support this building

I: Any others, or just [NGO]?

P: Just [NGO]

I: Just [NGO]. … Ok. … And you're from the SMC and a teacher

P: … SMC – I am?

T: School management committee

P: School management committee

T: *Nepali*

P: *Nepali*

T: He is only in the management, not a teacher

I: And, from the community and teachers (about the other participants present)

P: He is a part time teacher now. He is also part time teacher. He is the kitchen, of the kitchen and the support teacher. He, [Name] is, is volunteer teacher. And sign language teacher, interpreter

T: Interpreter

P: Interpreter. Sign language

I: Ok. … In the earthquake, or, before the earthquake, what facilities did you have? How many classrooms did you have? A library or anything like that?

P: No, we have two one building. One small shaped building. Community and teachers. Also, community *Nepali*

T: *Nepali*

P: *Nepali*

T: There were two rooms building, very small

I: So one building with two rooms?

P/T: *Conversation in Nepali*

T: That was not actually a concrete building, there was not even a pillar

I: What was it made from?

T: There was a roof, the same one. But the block, there was only the block

P: *Nepali* *Discussion between participants*

T: By the community member.

I: Right. And was that damaged or completely destroyed in the earthquake?

P: Some damage. *Nepali*

T: It was not completely collapsed, but not suitable, not safe

I: And now, in the reconstruction, what facilities do you have? How many classrooms, what spaces?

T: *Nepali*

P: *Nepali* 6 rooms

I: 6 rooms. Are they all classrooms?

P: …

T: Support classrooms

P: ECD class also, 6 rooms

P/T: *Conversation in Nepali*

T: One is office

I: Right

P: One sleeping room *Nepali*

T: One sleep, sleeping room *Nepali

P: *Nepali*

T: They have a hostel for that, they have one

I: Is that a separate building?

T: *Nepali*

I: Just one room?

T: The same building

I: Cool. … Other than the damage to the building, how was the school affected by the earthquake? Did the, how long did it have to close, things like that?

P/T: *Conversation in Nepali*

T: They can't continue the classes for three months.

I: Anything else? He mentioned canna *Nepali* [food]

P/T: *Conversation in Nepali*

T: What happened was, like, they couldn't continue the classes because they had no building. So they went to the municipality, rented a room, after three months, they could continue the classes.

I: In that rented room?

T: Yes, the municipalities room

I: What was he saying about food?

T: The other organisation came, they only gave them food and all the relief materials, but they didn't build any houses for them.

I: Right. And was the community affected by the school being damaged? Or was it just in the same way?

T: *Nepali*

P: *Nepali*

T: The community was affected, that's why they made the decision to rent the room

I: How was the community affected?

T: Because the children couldn't study

P: *Nepali*

T: The children, they are not from the nearby area, so the parents were less concerned, because they were in trouble, so they couldn't give much effort to find how their children were.

I: Right. How did they rent the room, did they have to pay for that, or did the community?

P/T: *Conversation in Nepali*

T: Probably municipality. From the ministry of education, the municipality, and the school.

I: So they all came together to help fund?

T: The school and municipality

I: When did the school get identified to start being rebuilt?

P/T: *Conversation in Nepali*

I: What's he saying?

P: *Nepali*

T: After one and a half years?

I: It was done one and a half years ago? It started?

T: No, after the earthquake. One and a half years after the earthquake means, er, I try to date it.

I: And … was that when the school was identified? How long, how did, how long did it then take to, like, confirm the design and decide what was going to be built?

P/T: *Conversation in Nepali*

T: 14 to 16 months. 14 to 16 months it took.

I: Till it was finished

T: From the project initiation to the construction finished

I: So

T: 14 to 16 months.

I: And how much of that was actual building? Like, when they were actually constructing – how much of that was that time?

T: It's like, from the project design to reconstructing the building, to complete the building

I: so that was how long they were actually building for?

P: Just 16 months

I: When they were building?

P: Yeah

I: Not, did that start right after, at 1.5 years after the earthquake.

T: yes, they started 1.5 years after the earthquake, and then when they, when the [NGO] funded, they should build a school here, that's why the way they started doing it.

I: Right ok. And how was the school identified? So did you have to go to [NGO] or did [NGO] find the school and say we're going to rebuild it, or did the government say 'they need to be rebuild'?

P: The government…

T: *Nepali*

P: *Nepali* All building have damage, all the school are damaged from Gorkha district, complete damage. Complete (?) *Nepali*

T: *Nepali*

P: *Nepali*

I: What's he saying?

P: *Nepali*

T: [NGO] is making …

P: *Nepali*

T: The management committee, they went to the ministry of education, and the ministry of education and [NGO] they were working together, so the ministry informed the [NGO], so [NGO] came here

I: Right. And who funds it, is it funded by [NGO], or by the government, or the school, or by somebody else?

P/T: *Conversation in Nepali*

P: [International aid organisation] funded [NGO]

I: right.

P: *Nepali*

I: And can they tell me what roles everybody played in the project, so what role did the school and the SMC play for the reconstruction?

T: School Management Committee *Nepali*

P/T: *Conversation in Nepali*

T: (?) [NGO] (?) (Long pause – phone call) Technical support [NGO]. School member like this make the environment to build the construction and they supervise *Overlapping talking in background*

I: The school?

T: Yeah, the school. Prepare the environment and then just look after the surrounding, like if anything, or anything get inside

I: Right

T: The supervision, just to look after

I: right. So, [NGO] had done the design

T: Technical support yes. The engineer was from the [NGO]

I: Right

P: [NGO]. Technical support [NGO]

I: And what role did [NGO] play?

P: [NGO]

T: [NGO]?

I: Did they just fund?

T: *Nepali*

P: *Nepali*

T: Funding project

I: Funding. …

Discussion among participant

T: And for the design also

P: Design also, and engineer

I: And also the design

T: Engineer

P: Design. [NGO]

T: Design by [NGO]

P: [NGO]

I: Right. Um, did engineers come and supervise, or do checks?

T: *Nepali*

P: *Nepali*

T: Usually they did. Almost every day.

I: Where did the labourers come from, were they volunteers or did you have to hire them?

P/T: *Conversation in Nepali*

T: There was a, they hire a construction company, so there was not a volunteer, they were all taking an allowance

I: Right, and

P: *Nepali*

T: But the teachers and the school management, they volunteer during the construction.

P: *Nepali*

I: And the construction company were local, or they come from far away?

T: *Nepali*

P: *Nepali*

T: Management committee

P: Management committee. *Nepali*

T: *Nepali*

P: *Nepali*

T: The labourers were local members

I: The hired ones?

T: The hired ones. And [NGO], they gave them training for the construction. And [NGO] gave them a daily allowance.

I: Right, OK. And did the, what role did the government play, other than helping to identify the school?

T: *Nepali*

I: did they have to come and do their own checks or anything like that?

P: *Nepali*

T: Government just used to come and just check whether the things are going right or not

I: Ok

P: *Nepali*

I: Ok. And how often did they come?

T: *Nepali*

P: *Nepali*

T: Quite often

I: Ok

P: *Nepali* 15 days

I: can we now talk about what the building is made from? So what materials were used to build the building?

T: *Nepali*

P: *Nepali*

T: Concrete

P: Concrete

T: Concrete

P: Cement. Cement

T: Cement, I don't know. *Nepali*

I: Bricks?

P: *Nepali*

T: bricks

P: Bricks. *Nepali*

T: (?)

I: Does he know what the foundations are made of, in the ground?

T: *Nepali*

P: rock, rock

T: Rock

P/T: *Conversation in Nepali*

T: Bricks and rock

P: *Nepali*

I: And where did all of the materials come from, did they, were they easy to get from close, or did they have to bring them from Kathmandu?

T: *Nepali*

P: Local material *Nepali*. Brick from Kathmandu, cement from Kathmandu, steel.

T: *Nepali*

P: *Nepali*

I: So the brick and the cement…

P/T: *Conversation in Nepali*

T: (?)

I: Here, or from Kathmandu?

T: Everything come from Kathmandu, but they bought from here

I: right, ok. (Pause). … Is there a water source at the school, to help make the concrete, or did that have to be, was that difficult to bring in?

P/T: *Conversation in Nepali*

T: …, there was not, because he is a member of the water supply, so there was no difficulties while they were constructing the building

I: Ok. It’s really close by? Is that a tap, or a pipe or something?

T: *Nepali*

P: *Nepali*

T: Pipeline

I: … Do they know what, how the building was made, so that it was strong in an earthquake?

T: this building? What it is made of?

I: Or, like, how it was made stronger

T: Ok. *Nepali*

P: *Nepali*

T: Before they used to just make a pile of the bricks, but now there’s more like, steels everywhere and by the door.

I: Beams all around?

T: Every step

P: *Nepali* Steel also join. 3 feet

I: Ok. Erm, did the, the government and [NGO] had chosen the design, did the school have any say in what facilities were provided?

T: *Nepali*

P: *Nepali*

T: They were not aware like, what they need to do, like, this or that, houses made of pillar, they didn’t fall down, so they were thinking like, we will make a school with the pillars, but not exactly the [NGO] has given the design, so they are happy with the design. They can, this building, this design is out of their imagination, they were not yet prepared to build a house, that’s why

I: So, the, the school was built to [NGO] design, which is better than they thought it would be?

T: Yeah

P: *Nepali* [NGO]

I: [NGO]

T: Somewhere like a dream project for them

I: And did they get to have any say in how many classrooms, and how much space they, they had built?

T: *Nepali*

I: Or were they just told ' you have this much'

P: *Nepali*

T: They just inform the government, like what actually they do need, and then [NGO] and government they decided to build this.

I: right

T: This is enough for them right now, for the school. For the school only, they still need a hostel.

I: Ok. So they need a separate hostel

T: Yes, a separate hostel.

P: *Nepali*

T: this is a residential school, so they still need a hostel.

I: Right. And I now want to talk about some of the challenges that was in the project, er, so was there any delays from identifying the school through to finishing the construction?

T: *Nepali*

P: *Nepali*

T: Due to rainy season, they couldn't able to, not a big problem, but quite a problem for them to bring the materials, and one more thing is, for the man power, because every house is very broken, so the labourers were very busy

I: Right

T: And they were getting more, more payment by the local member, so sometimes they refuse to work in the school

I: So they were getting more money to work elsewhere?

T: Yeah

I: Ok. … The, they were saying it's not a big challenge, the materials, bringing in the materials, just a little challenge

P: No, no, no, not much, not much

T: Not much

I: Normal challenge. And the problem with the labour, was that a big challenge or a little challenge? Did that have big delays?

T: It's not a big problem.

I: Were there any other challenges in kind of, with the government, or with getting the land available, or things like that?

P/T: *Conversation in Nepali*

T: The labourers were not quite as skilled for the new type of building

I: Right

P: *Nepali*

T: So, every time

P: *Nepali*

T: Every time the [NGO] have to come and teach them – that was a problem. That was quite a new concept for the local labourers, that's why.

I: Ok, but no other challenges?

T: No, regarding the construction, no

I: Ok, … did the school do anything to overcome any of the challenges, or to reduce them, were they able to bring in more material before the rainy season and things like that?

T: *Nepali*

P: *Nepali*

T: They did continue work when there was rainy season

I: They did continue?

T: Yeah, work did continue

P: *Nepali*

T: Project cycle *Nepali*

I: and did the school, was the school disrupted while the school was being constructed? Or was the rented building in a different place so the school could carry on as normal?

P/T: *Conversation in Nepali*

T: Because they were rented in a different house, they couldn't affect them.

P: *Nepali*

T: Though they couldn't get a proper space, and a playground like this

P: *Nepali*

T: Because the space was limited, there was only one room, and all the children one toilet, and on to continue like this.

I: And that was in the rented building?

T: Yeah, that was in…

P/T: *Conversation in Nepali*

T: Regarding the disturbance, there was no disturbance, but the one room, all the children in that context, it was quite difficult

I: Yep. … And then, I just have a few questions about the area and the community, … , so, is the community, or is like, the school affected by flooding, or the monsoon or landslides or anything like that?

P/T: *Conversation in Nepali*

T: Not in the school surrounding

I: Right

T: Not in the school premises, it is quite a safe area

I: Right, ok

P: *Nepali*

T: but the wind, it is quite a windy place

Overlapping discussion between other participants

T: And one more thing is like the dust, from the road, that directly comes inside the school, and the children can not, they don't pay attention

I: Is the road down to the highway, and that you'd get to Kathmandu, is that affected by the problems, or is that fine all year

P/T: *Conversation in Nepali*

P: *Nepali* No good road, no

T: They are not, they want a good road

I: Is that because of a landslide or something?

T: Landslide. He have seen the landslide

P/T: *Conversation in Nepali*

Overlapping discussion among other participants

P: *Nepali*

T: *Nepali*

Overlapping discussion from other participants

T: *Nepali*

P: *Nepali*

T: We are talking about the highway, we have a lot of pain, so they are showing us a direction that we have a good road, and the next way, we can go from there.

I: Right, you'll have to tell our driver

T: Yeah, we'll have to talk to him

I: Right, and then, is there any other construction that has happened in the area, because of the school, so, things like …, the people who worked on the school got training, were they then able to go and work on other places because of that training?

T: *Nepali*

P: *Nepali*

T: They were…

P: (overlapping) *Nepali*

T: They started building this kind of houses from this school, so they learnt from here, they thought, they built friends' houses in the community. And one more thing, the people in the community, they didn't know about this kind of houses, so while building this school, the people of the community used to come here and see how things are going on, so they could get some knowledge, so from that they copied on their house.

I: Right, ok, that's cool. … And then, my last question is, what has the affect for the school and the community been, having the reconstruction project done? Has it had a good impact, has it had not very much change?

T: *Nepali*

P: *Nepali*

(Overlapping - phone ringing over recording)

P: *Nepali*

T: The school is being an example, because of the new concept with the new building. The community is quite happy because they have the differently able person and they are getting the new environment and the good infrastructure. And one more thing like, the community people got to know the new concept of building, that's why they are really happy.

I: Right. Cool. Thank you very much, that's really helpful. Do they have anything else to add, or do you have any questions for me?

T: *Nepali*

P: *Nepali* You are a student?

I: Yes

P: A Student. *Nepali*

T: UK

P: UK. *Nepali*

T: Have you ever experienced an earthquake in the UK

I: … We have tiny earthquakes, very very small, like magnitude 4, maybe 5, but not as bad as Nepal.

P: *Nepali*

T: *Nepali*

I: there have maybe been two in the area, but I have slept through both of them, because they have been so small.

P: You have no earthquake in Nepal?

I: Pardon?

P/T: *Conversation in Nepali*

T: Do you know the earthquake, the Nepal earthquake, what impact it has had been or like, anything like that, in Nepal

I: I know a little bit. Do they want me to tell them things?

P/T: *Conversation in Nepali*

P: *Nepali* Civil engineer

T: civil engineer, of the PhD

P: *Nepali*

T: How many years do you need to study civil engineering?

I: … So my Masters, my Bachelors and Masters together was four years, erm, to be a civil engineer, you then have to do training when you're in work to get extra qualifications. … My PhD is another 4 years, but for that, you don't need to be a civil engineer.

P/T: *Conversation in Nepali*

T: What do you like, he is asking, like, what things do you like about Nepal? He was talking about the road construction, and like, I think she don't like the road, but I want to know what she really like about Nepal

I: It is very beautiful, *Nepali* (very beautiful), it's a beautiful country, and the people are all really lovely. Everybody is very welcoming and friendly. In the UK we just don't talk to anybody, whereas in Nepal, everybody is helpful

P/T: *Conversation in Nepali*

T: *Nepali* One more question..

Nepali from another participant Do you knowledge about these people, and these school, in the UK?

I: What's school like in the UK?

T: Deaf school

P: Deaf students

I: Deaf school, …

Nepali from another participant

T: Oh, it's like, have you met deaf people, or any school, or any institution like this, or do you know, do you have any knowledge about them?

I: … There are, I haven't been to a deaf school in the UK, but I think there are them. But we have within some of our, like, normal schools, we would have, some that specialise in, erm, deaf students, so they would have departments, they would have teachers who have, so there are some that are separate, and you could have different classes, but in some schools, they would be part of the normal lessons.

Nepali from another participant

P/T: *Conversation in Nepali*

Discussion from other participants in Nepali

T: One have been to Turkey, and like, they got an operation, the things, he had, in

Cochlear implant

T: Cochlear implant, and then he can hear

I: You’ve had that? Ah cool

Nepali from another participant

T: That’s a normal

Nepali from another participant

T: I can’t listen, like 100% exactly, but a little bit, if he’s in a peaceful environment

Discussion from other participants in Nepali

T: *Nepali* He wants to take a picture

I: Yeah. And can he take one on my camera as well

Pause for photos

End of recording

G.6. Case-specific 2

I: So, some questions about the school. So, the school name is [School]?

P: [School]

I: And, where is it – it is in [Village]?

P: [municipality]. District Sindhupalchowk. VDC, not municipality. [ward number]

I: And, is there like a smaller place?

P: [Village]

I: [Village]. How many students and staff are there, and how many classes?

P: 9 classes. ECD to grade 8. ECD to 8

I: Grade 8, which is how old? What age?

T: *Nepali*

P: 4 – 12, 4 – 13 age 4 – 13

I: Roughly how many students

P: 130, yeah

I: And, in the reconstruction project, who was involved? Which organisations?

T: *Nepali*

P: [NGO]. And [NGO]

T: [NGO]

P: [NGO]

T: For technical support

P: for technical support

T: Just technical support

I: And your name is [Name]?

P: [Name]

I: And your surname?

P: [Name]

I: Do you have an email address?

P: No

I: And your role? Are you headteacher?

P: Yeah, yeah yeah

I: Awesome. So, I'd like to know more about the facilities of the school. So I have different facilities, and then before the earthquake, what was damaged in the earthquake and after the earthquake. Um, so how many classrooms were there before the earthquake?

P: Er, 10

I: 10

P: Classrooms

I: And were they all damaged, or just some of them?

P: Yeah, total, total

I: And how many classrooms have you now got in your reconstructed school?

T: *Nepali*

P: 10

I: 10

P: 10

I: Have you got any school offices? There was one office here?

P: Yeah

I: Did you have any offices before?

P: 1

I: And that was also, everything was destroyed?

P: yeah, yeah

I: Um, what about things like a library or a computer lab, or science labs, did you have any of those? No. But you now have a library?

P: Yeah

T: *Nepali*

I: Toilets?

P: Yeah

I: How many did you have before and how many do you have now?

P: Now, boys and girls is different. Before earthquake, just one.

T: Just one. *Nepali*

I: And how many now?

P: 2. 2 boys, 2 girls

I: Um, and any other facilities that I haven't mentioned?

T: *Nepali*

P: *Nepali*

T: They have snacks

P: Snacks

T: Provided by the government. *Nepali*

P: *nepali*

T: They are managed by the internal monetary fund of the school

P: *Nepali*

I: Is that, is there a kitchen for that, or is it packet snacks?

T: No, they just packet snacks, and they are facing difficulties for that. Maybe they can't continue after few months

I: Right. In terms of damage to the school? So the entire school was destroyed in the earthquake?

T: *Nepali*

P: *Nepali*

T: It was not actually collapsed and all, but it was cracked, that's why

I: So unsafe?

T: quite unsafe, that's why they have to press it down and rebuild it.

I: What about other impacts to the school? So not the building damage, but did, were the children affected, how long did the school close, things like that?

P/T: *Conversation in Nepali*

P: *Nepali* [1 month]

I: 1 month?

T: *Nepali*

P: *Nepali* [TLC]

I: And a TLC?

P: A TLC, that is made by [NGO], TLC

T: *Nepali*

P: *Nepali*

T: They build a tent after the cracked building, they didn't let the children to get inside the classroom, they build a tent outside, until some outside.

I: And that was the TLC?

P: *Nepali* Tent and then after, TLC

I: Oh right, so tent before and then TLC. Ok. Um, were the community affected by the damage?

P/T: *Conversation in Nepali*

T: They were..

P: (Overlapping) *Nepali*

T: Community was somehow affected, but children would come to school because school was more safe for them then home.

I: Right. I have a timeline of the construction, so this is when the school was first identified, and then when the actual project started, when the contracts were agreed and things, the design and construction starting and finishing and then the school reopening, if that was the case. If you can give me dates for each of these?

T: *Nepali* Can he write, like, if he don't remember exact, can he write tentative

I: Yeah, just approximate, just like a month, a rough idea of how long things took.

T: *Nepali*

I: Just rough, just months or…

T: *Nepali*

P: *Nepali*

T: English date

I: English date. Or whatever, I can transfer after

P/T: *Conversation in Nepali*

I: Some things may happen at the same time…

P: *Nepali*

T: *Nepali*

I: So when plan first said, or you said 'we need to be reconstructed'?

P/T: *Conversation in Nepali*

I: Ok

T: *Nepali*

I: It might be that that isn't

T: (Overlapping) He is writing exactly when did they start using this building

I: Ok. And these are Nepali dates?

T: Nepali

I: Ok. Um, So how was the school identified, so did [NGO] come to the school and say we are going to rebuild, or did you have to go to the government and say we need to be rebuilt? Who identified the school?

P/T: *Conversation in Nepali*

T: It's like, [NGO], initially, before the earthquake also, they were taking the [VDC]

I: So [NGO] were already involved before?

T: Already involved, but what happened was, like, they have to build three schools only, in the entire area, entire [Municipality]. And he came in contact with [NGO], and [NGO] felt like they had to build a school over here, that's why they came themselves

I: So [NGO] were already here, so the school knew about them?

T: Yeah, already knew

I: And then after the earthquake, they could only build 3?

T: Yeah, after the earthquake, like, the headteacher and the plan they work for the rescue, even for the food and the relief materials, so they came to know each other, and he requested them to come over here, and even like, [NGO], they already have to build a school, so they choose this area.

I: And who funds the project?

T: *Nepali*

P: [NGO]

T: *Nepali*

I: All [NGO], or government money?

P: No, just Government

T: *Nepali*

P: *Nepali*

I: And then, the, all the people who were involved, what roles did they take? So what role did the school play?

T: The school?

I: Yep

P/T: *Conversation in Nepali*

T: So, [NGO] just gave them money, and everything like, the School Management Committee, they have to arrange everything, like whether the money is going right or wrong, and they have to buy all the materials by themselves. [NGO] just funded them.

I: Right

P: *Nepali*

T: Oh, and [NGO], they for the technical support, like checking the qualities, the materials used

P/T: *Conversation in Nepali*

P: *Nepali* [International government] *Nepali*

I: And what did the [International government] do?

T: No no, [International government], he is talking about, how did [NGO] get money, [NGO] get money through [International aid], it is like that

P: *Nepali*

T: What he is saying is, the Australian man will give it money, they told [NGO] that, they can't use their technical office for the building, because if they use their own people, they might be like, compromising the quality, so better to involve some other, so that they can give the best quality

P: [NGO]

T: [NGO], so they hire [NGO], engineer were from the [NGO]

I: What about the labourers, so the people who actually built the school?

T: *Nepali*

I: Were they contractors, or local volunteers, did the community help?

T: *Nepali*

P: *Nepali*

T: They are not the professional labour, but the community people, but they used to take wages from it, per day

P: Per day

I: Pardon?

T: Per day, they used to take wages, like a certain amount of allowance

I: Right

T: When building, but they are not actually

P: *Nepali*

T: *Nepali* Oh yeah, the community people are given the training to build the houses, by the [NGO].

I: Right. Um, what role did the government play?

T: *Nepali*

P: *Nepali*

T: They used to supervise how things are going

I: Right. So someone would come and visit, a government engineer would come and visit?

P: Yeah, yeah. 3 or 4 times

T 3 or 4 times

I: Did the community do anything; did the community have any other involvement, or just helping build?

T: *Nepali*

P: *Nepali*

I: No

T: *Nepali*

I: Ok. Um, my next questions are about the actual materials and the design. So you might not know very much about it, but just tell me what you do know. So what materials have been used, what materials for the main structure?

T: *Nepali*

I: So, for the main structure, what materials, what technology was used, was it concrete, brick, was it stone or timber?

T: *Nepali*

P: *Nepali*

T: Soling is by stone

I: So the foundations are stone?

T: foundation is by stone, and then bricks

P: Bricks, cement

I: Cement ok

P: Cement. Iron rod.

T: Rod

I: Steel bars

T: Steel yes

I: So its concrete frame

P: Yeah

I: And then bricks in between

P: Yeah

I: Ok. Um, where did you get all the materials from, was it hard to get the materials?

T: *Nepali*

P: Melamchi

I: Melamchi

T: *Nepali*

P: *Nepali*

T: What he said, what he said was like, if you have seen the road, it was like they started, like, starting in the rainy season, so they couldn't bring, like, as much as they want because of the road condition, road condition. After the rainy season it was easy. We can't say it's very easy.

I: For things like water, to construct. Where did that come from, was it local?

T: *Nepali*

P: *Nepali*

T: [NGO], they have constructed the pipe

I: A pipe?

T: Yeah, a pipe, for the water. They used some water resources from there, and still the pipe is still there.

I: And can they still use that water for other things?

T: *Nepali*

P: Yeah

T: Yeah, they are still using that

P: *Nepali*

I: Were there any other materials that were looked at that you couldn't use, or was it always going to be concrete and brick?

T: Huh

I: Were there any other materials that they wanted to use but couldn't, or did they always go with that option?

T: *Nepali*

P: *Nepali* [agreement]

I: Ok. School is one storey?

P: [agreement]

I: There are two buildings?

T: *Nepali*

I: This building and the toilets?

P: [agreement]

I: Do you know what, do you know if they used any design to make it stronger in an earthquake?

P/T: *Conversation in Nepali*

T: They did a very deep, inside, and you know, how we build in [NGO project], every frame is very strong, same thing

I: Did they have, like, things going round, underneath the windows, or above or anything?

T: *Nepali*

P: *Nepali*

T: Yeah, they have them

I: And then, any other features, to make it safer in an earthquake, so not just the building, but extra things to make it safer?

P/T: *Conversation in Nepali*

T: They have used, they have used the most expensive things in Nepal, like cement, and the high quality rod and everything.

I: I saw there was a ramp, a wheelchair ramp

P: Ramp

T: Wheelchair ramp?

I: there is a ramp, down there

T: Ah, wheelchair ramp. *Nepali*

P: Ramp

I: and each class has 2 doors, so it is easier to get out?

T: *Nepali*

P: *Nepali*

T: No, the teacher (?)

I: Who, um, got to choose the design? [NGO] controlled the design?

P/T: *Conversation in Nepali*

T: Actually design is framed by government, education ministry, and then [NGO], [NGO] they worked according to that.

I: And did the school get any say in how many facilities they needed?

T: *Nepali*

P: *Nepali*

T: They have requested the ministry, like, they don't want, how to say that, the one roof, the same one, they had enough, because they want to build more storeys, that's why the government refused the design

I: And was there anything else they wanted to have but they couldn't?

P/T: *Conversation in Nepali*

T: The school wants to build one more storey building, but because of that roof, they can't continue that, and, why do they want to do is like, if they can build one more storey they have, they can have more space, so that, there will be more space around for the children. Even they want to build a concrete wall in the surrounding, but no NGO have been supportive.

I: Right. So, in terms of the construction, was there any challenges involved, were there any delays in the project?

P/T: *Conversation in Nepali*

T: During rainy season, they couldn't bring materials on time

I: Right

T: They got delayed, and one more thing, they couldn't get a proper bill of the material. And they had to go to Kathmandu to buy some of the things, they couldn't get everything in the local area.

I: So mostly while constructing most of the challenges happened?

T: [Agreement] *Nepali*

P: *Nepali*

T: Man power were not well trained, so sometimes they couldn't do things. They couldn't understand exactly how to do this.

I: Was that a big problem or a little problem

P: Small

I: little problem

I: And the problem with the materials, bringing the materials. The problem of bringing the materials, and the quality, was that a big challenge or a little challenge?

P/T: *Conversation in Nepali*

T: So the things like cement, they can buy over there, but the wood and things, (?) things, they have to go to Kathmandu

I: And was that a big challenge, was that a big problem or…

P/T: *Conversation in Nepali*

T: It was not that big

I: Ok. What about the government process, was there any problems with the government, and getting approvals and things like that, or what that all fine?

T: *Nepali*

P: *Nepali*

T: *Nepali* Because everything was done by the Ministry of Education, so they don't have to take lots. (long pause)

I: So the next one is quality and the suitability of the land? So it might be that they had this space that was fine. (long pause)

I: Were there any problems with the community being involved?

T: *Nepali*

P: *Nepali*

T: People used to come, and ask how things are going on

I: Right, and what about the land? Was there any problems with getting land available, or it being good quality?

T: *Nepali*

P: *Nepali*

T: Um, there was landslide, and what happened was like, while building the school, there was a landslide. So [NGO] build that stone thing [on the slope behind the school]

I: Right

T: And after that they continue building school

I: And were there any other challenges the school had?

T: *Nepali*

P: *Nepali* [no]

I: No? The school was still running while the building work was taking place, so were they able to minimise how much the school was disrupted while the construction was taking place?

P/T: *Conversation in Nepali*

T: While there was the reconstruction, the children were, the school was continuing over there in the tents, and the construction was going on here

I: So they were separate so it was fine?

T: Yeah. We can't say they are not disturbed the classes were going on.

I: Were there any steps to overcome some of the problems you had, like the retaining wall you had to do?

T: *Nepali*

P: *Nepali*

T: When there was landslide, [NGO] brought the geologist to do the foundation, and [NGO] used to be here every 2 or 3 days, so when there was any challenge, they would work together.

I: and is there anything he would change about the process, if he could improve it, if he had to do it again?

T: *Nepali*

P: *Nepali*

T: If he wanted to change anything, he would make a 2 storey building, as the classes are not enough for the children. And one more thing, they want like, he wants to conserve this area, like, they have no proper walls, so everyone can get inside the area, and the animals. And one more thing, they want to establish a fund for the reconstruction of the school, so in the time of emergency they can have that, a reservation fund for construction.

I: And then I just want, just a few questions about what is going on in the surrounding area, and they we are finished. Are there any other hazards that affect the area, so you mentioned landslides, is there any problem with flooding, or monsoon or anything?

T: *Nepali*

P: *Nepali*

I: No? Um, is there any other reconstruction work happening in the community, and if there is, has that been linked to the school, is it the same materials, or is it completely separate?

P/T: *Conversation in Nepali*

T: Only the school

I: Just the school. And is that the same in other nearby villages?

T: *Nepali*

P: *Nepali*

T: They have completed the house.

P: *Nepali*

T: At the same time

P: *Nepali*

I: Did the people who helped build the school, were they able to go and build their houses with the skills they'd gained, or had they already rebuilt?

T: *Nepali*

P: *Nepali*

T: No, they had different (?)

P: Different

I: And, my last question is, what is the effect of the school being reconstruction, both for the school and for the community?

T: *Nepali*

P: *Nepali*

T: (?) Because there was construction going on, and the children, the noise of the construction disturbed the study, and even some of the children they were injured.

I: Right

T: And yeah, even like the head teacher he couldn't give the time to teach the children, so, he has to run less classes during the construction.

I: The children were injured during construction? And how did that happen?

T: The construction was going on right there, and maybe they got some nail in their, they caught their legs, and they got injured. And even, they couldn't continue the classes for few months, classes were very disturbed.

I: Has it overall been a good thing for the school, having the new building, or not?

T: *Nepali*

P: *Nepali* Yes

I: Yes?

T: Before earthquake, it been good

I: It is better now?

T: It is better now than before

I: Thank you very much, that is all my questions, I am finished

P: *Nepali* There were students from Cambridge university, there was a school programme.

I: so they helped with the construction?

P: No, no

I: or just after?

P: *Yeah*

I: What were the students doing here?

P/T: *Conversation in Nepali*

T: Oh, they came here to teach the children, for one month

P/T: *Conversation in Nepali*

T: The one who was sitting here, she is a Nepali, but she lives in USA, she is here to teach for one year

P: *Nepali*

I: How do people, how is your school identified that people will come here?

P/T: *Conversation in Nepali*

T: *Nepali* They are volunteers, they come to know from the [NGO] organisation

P: *Nepali*

T: And during the, after the earthquake, [NGO] provided the children with school bags and *Nepali* School bags

P: *Nepali*

I: Oh, I saw an article about that

T: School bags and note books

P: I will call [Name]

I: And this building [currently being constructed], did you have to ask the government for that after, did you have to say we don't have enough buildings, or did they come to you?

P2: Hi, nice to meet you. So are you here on research?

I: Yes, PhD Student

P2: Cool. Where are you studying

I: Newcastle University, in the UK

P2: So I am here for 10 months, although it's almost over though

I: Have you enjoyed it?

P2: Yeah, its been nice, it's been different. But yeah, it's almost over. I have 2 or 3 more months yes, so just until the end of December, but it's been cool. What sort of research are you doing?

I: so, I am an engineer, and I am looking at the process of how schools are being rebuilt.

P2: So, like the structure and everything

I: So looking at the materials that are being used, but also how the projects are set up, how schools are identified, trying to look at how the whole process works, to find ways to improve the process

P2: ok

I: And find the ways that work really well

P2: And is that like post-earthquake how schools are being rebuilt.

I: Yeah, but then hopefully then extending that to look at retrofitting, and improving the schools in Western Nepal where schools are still vulnerable

P2: Right. Cool, so you're mostly doing in Sindhupalchowk district, are you just looking here, or are you looking all over the place?

I: All over the place, so I am mostly looking at schools that have been rebuilt, and we just record where it goes.

P2: I think a lot of schools are being rebuilt in western Nepal , because the earthquake didn't really affect there. I think that's why we're stationed here too.

I: so how did you come to be here?

P2: So I'm here through the US department of, so from the United States Department of State, and we have 5 or 6 volunteers, fellowship, fellow volunteers who are here, all in Sindhupalchowk, just in different schools around the area. If you are going to any other schools around [Municipality], I have a friend at [Municipality] too, [Municipality], [Municipality]. And then 2 schools that are a little bit more north, close to the Tibet border. So we are just here on 10 month stay, kind of like as a cultural exchange, so I stay with a host family here, who is also a teacher here.

I: right

P2: So I get kind of a home stay experience, which I think is kind of, has ups and downs. I think that has probably been the hardest part because, with school I came in knowing some of the difficulties that would happen here. But with homestay issues, things that you don't really expect, having to be like 110% on all the time, things like that. But it's been so rewarding, the kids have been precious, so incredible. English levels are pretty low here, so I speak fluent Nepali, so that has been really beneficial for me over my fellow colleagues. But because you are in an environment where you're constantly made to speak Nepali, it kind of forces you to get better at Nepali, which has been nice. But yeah, yeah, it's good. Our new building has been, I mean, I've been here for like 5, 6 months and that's pretty much what it looked like 5, 6 months ago. Monsoon really just puts everyone on a setback. I think out of most people in Sindhupalchowk, we're actually in one of the more developed areas, just because we have road access and we are close to [Municipality], the Bazaar. But I have friends who are 10 hours away from the bazaar and they are having food shortages in their village. So building schools is like last priority for them right now, they don't have enough to eat. (Long pause)

P2: Yeah, but it's been good.

I: so did you arrive once this building had been finished?

P2: Yeah, so this was already finished, this was finished, according to the sign outside, about a year ago. So this building was already finished, that pretty much looked the same. We had another building down there, that was mostly already finished when I came here, and we had a couple of students down there, we had class 8 and class 6 down there, but, once this building was a little bit closer to being finished, we moved them down there, up here, because as the monsoon started putting water damage down there. So because of the monsoon, all water just would go down there. Like they would be swimming, it would be over their ankles, it was like 'this is ridiculous'. But yeah, I think this building should be finished pretty soon, I think all that needs to be done is plastering. But we moved grade 6, 7 8 in already. But this, I mean, pros and cons of the earthquake too, is a blessing in disguise, the buildings are much stronger now. That's what everyone has been telling me, even with schools and people, their actual homes and everything, are much stronger, because now people are more aware. Before it used to be like, let's just stack 5 floor long buildings and do whatever. I remember being, I had, a neighbour told me, they used to have these storage as the top floor, so like the heaviest materials as the top floor. And that makes no sense, and they would all sleep on the bottom floor. But things are a lot more stable now. Yeah, I think people have realised to build better, stronger homes.

I: Yeah, I think that's the hope. Like it was obviously dreadful, but if you can improve it

P2: Absolutely

I: And in the future, because it had been so long since a major earthquake

P2: Absolutely. And it's kind of lucky that the earthquake was on a Saturday, because I mean, the students, nobody would have survived in the schools, the schools were completely destroyed. So yeah, all blessing in disguises. Do you have any other questions I can answer, or did he get most of it?

I: I think he got most of it. In terms of, is there a road directly to the school, because we walked down to the school from a road up there.

P2: Um, no. There is a road, because there are cars that come down, there is a road that comes this way, but because of the monsoon it is still kind of being rebuilt. Um, but, yeah, the main way of transportation around for people these villages is just walking through ?? which is probably where you came down. But there is a road here, but road is a loose term.

I: Yeah! So when the materials were coming down?

P2: Yeah, they have cars and trucks that come down. … That's another reason why construction stops during monsoon, the road is an even looser term than it is usually!

I: Yeah, there is kind of a line over there…

P2: No, absolutely, it's just kind of a load of rocks thrown down, and it's like, that's not a road! That's not anymore of a road than this is a road. It's fine.

I: Oh, well, it's been really nice to meet you.

P2: Yeah, and you. What was your name?

I: Louise. And yours?

P2: [Name]

I: [Name]. Well nice to meet you. And enjoy your last few months

P2: Yeah, let us know if you have any other questions.

I: Do you have an email address?

P2: Yeah, I can write it down for you. [pause] I still use Hotmail, don't judge me!

I: Everyone's got to! Thank you very much

P2: Yeah, absolutely, have a good rest of your stay here

End of recording

G.7. Case-specific 3

I: Sign here to say that you are happy to take place, your name and your signature

P: My name?

I: Yes

P: [Name], may I write it with my pen

I: yes (Pause) Thank you very much

P: You're welcome

I: so this is [School]

P: [School]. [School]. [School]

I: Secondary. And how big is the school, so how many students, how many classes, and what age of students

P: in this school? *Nepali*

T: *Nepali*

P: Our school, location is, er

I: so, [Municipality]

P: so that is town. Our municipality, municipality, municipality, ward number, ward number, Sindhupalchowk district

T: *Nepali*

P: [Municipality]

T: *Nepali*

I: So how many students, and how many classes

P: *Nepali* I have to count, may I count in this register

I: Yeah, Or roughly, 100, 200, 1000

P: I have 32 teachers

I: 32 teachers

P: And about 800 students, 800.

I: Ok, and how many classes is that?

P: ECD to 12

T: *Nepali*

P: In class 9, in class 19 and 11 we have two sections, one is technical school, and one is… 9 to 11

I: In classes 9-11 there are two classes each?

P: yeah, no, yeah. In 9 to 11 we run the school in the time of day. But in 11 and 12, we conduct in evening, in morning.

I: Right

P: 11 and 12 we conduct in the time of morning, but there is one class 11, which is electrical and civil engineering, technical school

I: I'm a civil engineer

P: Civil engineer class, we conduct this one, in the time of day

T: Are you talking about the structure, or like, the number of classes, or the number of subjects

I: So, whichever is relevant, so if there is, there might be 12 years, but that might be, in each year there are 2 classes

T: So he is saying, in 12, there are 2 classes. But if you are asking about the number of classes, I will have to ask him how many numbers they have in the school. But if not then it is fine.

P: In 11 and 12, only 2 subjects that are compulsory, numeracy and majors. Major classes

I: Ok. Um, who was involved in the reconstruction, so who helped build the new schools, the new building

P: Just wait. [NGO] supported us to, [NGO], liaises, [NGO] supported us to make. Physically disabled person. *Nepali*

T: *Nepali*

P: [NGO], and (?) built a classroom, and we will see later.

T: Ok, they have made 2 classrooms for intellectual

P: 2 classrooms and 1 hostel

T: and one hostel

P: *Nepali* Intellectual disabled person

I: Ok

P: And these two buildings, DLPIU, DLPIU, DL…

I: (Overlapping) Yep. So they helped build these as well

P: 2 buildings. One is completed and other one is being built

T: *Nepali*

I: So which ones did [NGO] help with?

P: [NGO]

I: [NGO]

P: [NGO]

I: Which buildings did [NGO] help with?

P: No, there is other, another building, we will see late. These two, one is completed, and another one is, we are now just starting. These two buildings, er, building in, helping us to make, DLPIU.

I: Ok

P: Means, government support

T: *Nepali*

P: *Nepali*

T: It’s like, DLPIU means, actually it is, taken by the government, government takes help from different organisation, different countries

I: Ok

T: That is called DLPIU

I: Ok. [NGO], were they involved?

P: This building is, building is, made, being here, this was built by [Organisation]. From India.

I: Before earthquake or after?

P: Before actually

I: Ok

P: After, After.

I: After?

P: After. [Organisation]

T: He is a person

P: [Organisation], not is this. [Organisation]

T: [Organisation]

I: [Organisation]

T: [Organisation]

P: [Organisation]. Helped us to build this building

I: Was he an engineer, or a builder, or a mason?

P: That one is mason, in India, from India. [Organisation], do you know? They are

T: Oh, they are – actually they are a religious organisation

I: Right

P: This building constructed, there was a building, that was totally damaged in the time of earthquake.

I: Is this a TLC or is this permanent

P: This one is, this one is neither TLC or permanent

I: both. So, [Organisation] helped build this?

P: This building.

I: And then [NGO] did one building?

P: [NGO] built 2 buildings, one is hostel, and 2 are classrooms.

I: Oh, so [NGO] did these two

P: Yes. Other one…

I: and then DLPIU..

P: that building, which is, that you have just seen, … that building * Nepali*

T: 3 storeys building

P: 3, it means

T: 3 storey

P: 3 storey, store?

T: Storey

I: Storey

P: storey means?

I: Floors

P: 1st floor, second floor, third floor. That building was re…*Nepali* retrofitted

I: So that was built before the earthquake

P: retrofitted. That was built by our *Nepali*

T: Minister for education

P: Ministry of education. That building was partly damaged at the time of earthquake. 1 person *Nepali* (?) Give us 20lakh, Nepali 20 lakh rupees. We can to rebuild ground floor, and (?) Nepal give us 8 lakh, 8 lakh nepali rupees, 8 lakh means 0.8 million, 0.8 million. 2 million give us, you have to write, do you have (?) ok – [Name].

T: [Name]

P: Name of person who helped us

I: who was just a volunteer?

P: Yes, [Name]

T: [Name]

I: [Name]

T: [Name]

I: [Name]

T: [Name]

P: [Name] give us 2 million rupees. 2 million. [NGO], [NGO] is an organisation, an organisation

I: How am I spelling that?

P: [NGO]

I: [NGO]

P: [NGO]– these are NGO, INGO, [NGO] give us 0.8 million, million. In total, 2.8 million are the other school support. The remaining *Nepali*, amount, support

I: And the school provided the rest

P: The school

I: For the reconstruction?

P: Retrofitting

I: Retrofitting

P: Retrofitting. 3 lakh are from the district education, district education give us also help. DU help us. These…

T: 0.8

P: 3.8 million rupees. Retrofitting building. Retrofitted

I: Ok

P: [NGO] give us 20. [NGO]. No, *Nepali* we will be supported [NGO], we supported [NGO] and [NGO] built us one TLC.

I: Ok, So, before the earthquake, did you just have that building, or were there other buildings that were damaged?

P: No, there were so many buildings before the earthquake

I: and were they destroyed, or just damaged?

P: Many, the building was once built with stone and mud mortar. They were all totally damaged. Some buildings which was constructed new, with, was found by us, [NGO] *Nepali*

T: Well, like, we have an earthquake before (?). it was, most provided us with (?). At that time, there was the Red Cross, they provided with ?? and there was not actually

P: Total damage

T: Not totally collapsed, but damaged, so they build a new school

I: So they weren't safe? You had classrooms, did you have any other facilities, did you have offices, or library, or computer lab, or science lab or anything?

T: *Nepali*

P: *Nepali* We have before earthquake a building which has room two *Nepali*

T: They had a used library before, but after the earthquake, they all got damaged.

P/T: *Conversation in Nepali*

T: They have all the things they had before, now they have.

I: Ok

T: *Nepali*

P: *Nepali*

T: They had before, but this one is more than 10 years

I: But these are still good?

T: Mmm

I: And then things like toilets?

P: Yes, but there is not enough

I: Not enough. And they were damaged in the earthquake, or they were fine?

P: Yes, prime minister began – (?) Constructed by [Organisation]

I: They were damaged or not?

P: Damaged, we have…

I: But you can still use them?

P: Yes

I: Ok, other than the damage to the actual buildings, what impact did the earthquake have on the school?

T: *Nepali*

P: We lost two madams.

I: They were killed?

P: Teachers, we lost two teachers and 7 students. Many students were *Nepali*, injury

I: Were they in school or were they at home?

P: Own home – the day was Saturday

I: So the students weren't in school because it was their day off. How long did the school have to close after the earthquake?

P: About 2 months

I: 2 months

P: as per the government inform us. We will return to school, about 2 months

T: *Nepali*

P: *Nepali*

T: They had a football tournament

P: Badminton

T: Badminton tournament

P: District

T: District level. And with their luck it was finished, and they were about to announce the winner, at that time there was earthquake, killing no one. What could happen to many people. Do you have any questions?

I: Can we talk about the reconstruction process? So both [NGO] and the DLPIU, when did they come in to start doing the reconstruction. And did they, did the school approach the DLPIU?

P: Yes

I: or did they come to the school and say they will rebuild?

T: *Nepali*

P: *Nepali*

T: It is like this, er, [NGO] came here , the school invited. The thing is, when the earthquake happened, there were few buildings left, they were partially damaged, but not fully damaged. So all the building materials were stored there. So [NGO] have to come here to distribute. So they came in contact.

I: Right

T: And [NGO] came to know that there were lots of materials here, at least one building here. So they started building like the plan and then the ministry, in the government system, there is a quota system and area wise, this area has to, 3 building that are granted by the government, so the headteacher contacted with the ministry of education so they came to the school

P: We know nothing about this madam, as we are only teachers. All things are directly done by our head teacher

I: That's fine. Do you know who funded it, or not?

P/T: *Conversation in Nepali*

T: He said, he has already said that, who has given money

I: Was that for the retrofitting?

T: Yes, and according to him the [NGO] didn't give any money, they came themselves, and had one engineer on standby, and then all gave? Some.

I: And the school provided the funds?

T: No, they did.

P/T: *Conversation in Nepali*

T: [NGO] didn't have funds by themselves, and rest of the buildings, the government gave them money, and everything is done by these two.

I: So [NGO] funded that building, and then everything else, the government?

T: *Nepali*

P: *Nepali* *Agreement*

I: Do you know how long it took to actually construct?

T: *Nepali*

P: *Nepali* (consults another person) I know nothing

I: Ok

P: [NGO] gave us money and we rebuild the building

I: Do you know if the school had any say in what was built, and what facilities were provided?

P/T: *Conversation in Nepali*

T: school to a long time for construction *Nepali*

P: *Nepali*

T: Ok, they didn't have land for the school, so the [NGO] and the government took time to come over here. And they just started, like 2 years after the earthquake

I: To actually rebuild?

T: Yes, to rebuild

P: 3 others have been …

T: 2 years, 2 years. And what happened was like, the building *Nepali*

P: *Nepali*

T: it was completed a year back, this building, and the construction going on, started from the April, lead up April, or something like that

I: This April?

T: Yeah, this April

P:* Nepali*

T: And then this one, is like, just after the earthquake

P: *Nepali*

I: So this building took about a year to build?

P: No,

T: 5months

P: 6, 7 months

I: 6, 7 months

P: *Nepali*

I: And during that time, was the school running all the way through, or did it have to close while it was being constructed?

T: *Nepali*

P: Yes

I: all the way through?

P: *Nepali*

T: And there is a campus building, and they used to run the class on that building, the school class, only school

P: Only college, run at the time in morning, college morning, school day.

I: Right, so you would do them, and then..

P: 6am to 10am we conduct college

I: Wow, that is early

P: After 10, we conduct school

I: Ok, in terms of the materials, … concrete, cement and bricks?

P: concrete, cement, bricks

I: Do you know where they came from or not?

P: *Nepali*

T: *Nepali*

P: We took, we take bricks from Bhaktapur

T: where there are lots of brick factories, all the bricks come from Bhaktapur

P: Bhaktapur

I: And was that easy to do?

T: *Nepali*

P: We give money

I: Right

T: To build strong bridge

P: *Nepali*

I: Does the school have a water supply?

P: water supply? Poor condition

T: *Nepali*

I: Was it hard to get enough water when you were rebuilding, for the cement?

T: *Nepali*

P: *Nepali*

I: No

P: Wait a minute madam *Nepali*

T: *Nepali* for the construction, they brought water from the stream, like that would be total for construction, and the water is like, the private property, (?)

I: And is that far away, or close?

T: *Nepali*

P: 5km, 2,3, km, 2,3, km

I: you had to carry water all the way?

T: (?)

P: (?)

I: Right. (Pause) I want to talk about some challenges. So were there any delays in the project that you know of?

P/T: *Conversation in Nepali*

T: With this building, it was quite delayed

I: Why was that?

T: *Nepali*

P: Main government

T: *Nepali*

P: *Nepali*

T: Oh, the main cause is like, they struggle with, the stone, they have to break it, and they didn't get far with it

P: *Nepali*

T: Another cause was, in the rainy season there was a blockage

P: Landslide

I: And that stopped the bricks from Bhaktapur?

T: *Nepali*

I: Yep? He mentioned land, there was land

T: Landslide

P: Landslide

I: but you also said, it took a long time to start the project because the land wasn't available.

T: Oh *Nepali*

P/T: *Conversation in Nepali*

T: Not for the other building, just for the [NGO] building, because there was like, plant (?) But for the rest of the building, like, they have to bring all the damaged building, but this one, the damage to do that, at the start that took the time

I: Right

T: Mostly, mostly like man power

P: *Nepali*

T: *Nepali*

I: so would you say the manpower was a big problem, or a little problem?

P/T: *Conversation in Nepali*

T: He said, because, he is saying that because of the road blockage, and the man power. Everywhere there is going on construction, so man power is.

I: Ok. And they were big problems? Were there any other problems, like being able to get materials, getting enough materials? Problems with getting approvals

P/T: *Conversation in Nepali*

T: So the school was trying to…

P/T: *Conversation in Nepali*

T: *Nepali* It's like, people get (?) by the school, because they buy lots of materials and the buildings bad, for the profit, so for that sake, there was no shortage of materials for this school

P/T: *Conversation in Nepali*

T: He is saying the same thing, because of the government level priority (?) *Nepali*

P: *Nepali*

T: He is saying it's like, if, if I go to the shop and ask for the materials for the construction, they don't give much value to me, they don't give value to institution, because they buy more, so in that case, in school, even though there are shortages of certain things, the school they can get easily the materials

I: because the government and [NGO] help?

T: Because, like, monetary fund, because the school can pay them more money

P: *Nepali*

T: *Nepali* because they can also like, the individual, for the builders, they can't trust the individual, but they can trust the institution. And this is a government school, so they can just go and knock to the government, that is the thing

I: … Was there any way that, … any of the challenges were overcome, was there anything put in place to make things less of a challenge?

T: *Nepali*

P: *Nepali*

T: What they do, they are going to bring all the resource, like the things like building equipment out,

I: Right

P: *Nepali*

T: After this building is still up

I: Were they able to bring all the materials before the rainy season?

P: *Nepali*

I: Yep?

T: the villagers they didn't get the materials but the school did

I: right

P: * Nepali*

T: … The other thing is like, you have seen the road condition. Why they have sufficient resources, they are close to the road, every road in the village was blocked, so for that, it was quite a good opportunity for the resource

I: So the villages that are further that way, they struggled, but you were fine here

T: (?)

I: These are my last questions.

P: Yes

I: how far would you say you are from Kathmandu, is it easy? How far from Kathmandu are you?

T: *Nepali*

P: We have 2 roads, 2 roads to Kathmandu. 1 is about 70km with, (?)km. We have to go (?)km to Dhulikel, Banepa, Bhaktapur. One road is very lengthy, long

T: we came the long way

I: we came the long way, right

P: And the other way is very short

P/T: *Conversation in Nepali*

T: half the length, almost half the length.

I: and the longer one, windy roads, or main road?

P: Long one is Araniko highway 47km,

T: The way we came

P: Araniko highway

T: This way is 70km

P: This one is 47km and 23km we road up

I: on the little roads?

T: Off road

P: off road, 23km

T: *Nepali*

P: *Nepali*

I: and the next one?

P: the next one is *Nepali*

T: *Nepali* Good road

I: Good road

P: *Nepali*

T: *Nepali* It's like, half, half of the road is gravelled and half is good, good condition. *Nepali*

I: are there any other hazards in the area? So is this area affected by floods, or the monsoon, or landslides or anything?

T: *Nepali*

P: *Nepali*

T: *Nepali* Only earthquake

I: Only earthquake

P: in this school building, as you are watching, we have no problem of landslide

I: any flooding?

P: No

I: Just the landslides on the road

P: yes

I: have you seen any other reconstruction in the area, that has been similar to this one, and did people, did the labourers who worked on the school work on other projects as well?

P/T: *Conversation in Nepali*

T: They do

I: Yep

P: *Nepali*

T: They, they worked here, they worked up the hill with the houses

P: They build personal house

I: Right. Did they have any training here?

P: Yes

I: and then they could take those skills to their new projects?

T: *Nepali*

P: *Nepali*

T: There is a organisation called [INGO], who helped us with the house building, housing project

I: Say again

T: [INGO]

P: INGO

T: Help us

P: [INGO], and [NGO]. [NGO]. These are INGOs

T: (?)

P: (Overlapping) They do housing projects

T: They do housing projects

P: Housing

I: And so the labourers.

P: They give training, building home

I: Right, so they, had they already trained the labourers before they came to the school or did they, did they train them while they were here and then they moved to the school project, house projects

T: No, they did here and homes around

I: Right, so they got training at the houses as well

P: *Nepali*

T: *Nepali*

I: My last question..

P: Yes, miss

I: How has the school been affected having been able to have the reconstruction?

P/T: *Conversation in Nepali*

T: After the earthquake, they are not able to continue outdoor activities for 3 years. You have seen there is a lot of the way

I: There is a what?

T: There is

I: Ah, all the materials

T: All the materials. Though the classes were running, the activity, they can't run the activities

I: but now that it is finished, or when it is finished, they can go back to having that space?

T: It takes time

I: Yep

P: *Nepali*

T: It is not finished here yet

I: So when all the materials go, you will get all your outside space back

T: *Nepali*

P: *Nepali* (Huncha – Yes)

I: Ok. Is there anything else you want to tell me, or is that it – have I picked your brains enough?

T: *Nepali*

P: *Nepali* There are 4 secondary schools within 10 minutes of the road. *Nepali*

T: Private?

P: 3 are private and one is government. 10 minutes *Nepali*

T: *Nepali*

P: *Nepali*

T: *Nepali*

P: *Nepali*

T: Some of the school is like, the children just have to pay 100

P: Only 100 rupees

T: Only 100

P: only 100 rupees. They pay monthly 100 rupees

I: Is that small or big?

P: *Nepali*

T: For every level they have to pay 100 rupees. And for post 12, for the higher school..

P: Diploma level, they teach, they teach even only 100 rupees

I: So that is very cheap?

P: One school is that

T: very cheap

P: One school is that, these two are private

I: And this one is government?

P: This one is government

I: So, do students pay to come here or not?

T: *Nepali*

P: No

T: *Nepali*

I: Free?

P: *Nepali*

T: Technical subjects only

P: Technical means civil engineering, technical. 1000 each. *Nepali*

T: For 1-8 is totally free, that's the government system. Technical subject is 1000 rupees per month. And for 9-10, 100 rupees per month. Very cheap

P: *Nepali*

I: Awesome. Thank you very much. Do you have any questions for me?

P: *Nepali*

T: So he is talking about the trade, in secondary school. 7 students got the A+

P: 26 got A

I: Wow – good school!

P: They are, our school is going to celebrate Dashain festival on Monday. The students are preparing their performance

I: Right

P: Many of them were, are *Nepali*. Many left the school at 4:20, but some are practising. It is very nice to meet you

I: And you. Have you got any questions for me?

T: *Nepali*

P: About the school?

I: About my research or anything?

P: Best of luck, I want to tell you

I: Thank you very much

P: What else do I?

I: Pardon?

P: What I felt, may I?

T: How can he help you with?

I: You have helped enough, your answers have been really helpful. After this, I am visiting different schools, and I am seeing what happens in different schools. And in each school learning what has worked well, and spotting challenges that crop up, and trying to understand how we can overcome those challenges. And so, you have given me some really good information to understand some of that in this location.

P: I gave you exact?

I: Useful information. Thank you very much, can I shake your hand

P: It is very nice to meet you

I: And you

****end of recording***

G.8. Case-specific 4

I: So, I want to know about the school facilities, so what there was before the earthquake, what was damaged in the earthquake, and then, what is now being reconstructed. So, for the classrooms?

P: Pre-earthquake, classrooms were very old, and we did not have the good facilities of furniture, er, furniture, … facilities of furniture, as well as fresh air, there is not passing the air from, … other sites. And classrooms are some dark, you know, there is not sufficient air also, and light also. After the earthquake, we have the good classrooms, sufficient air and light, air and light and enjoying, students are also enjoying the classrooms and they are, er, morality, they have high morality [good morale], and they have the good hope of the, higher education, as well as others, … others.

I: How many classrooms were there before the earthquake?

P: Before the earthquake there are only 12 classrooms

I: 2? 12?

P: 12 classrooms. After the earthquake we have safe classrooms, 10, 10, and other 2 are semi-permanent classrooms, these 2 are also semi-permanent, semi-permanent, and that is, free from the risk of earthquake.

I: so, 3 were damaged?

P: Yes

I: So, post-reconstruction there will be 24 classrooms?

P: Yes, 24 classrooms

I: Um, what about offices?

P: Offices, … before the earthquake, we don't have the science lab, library, as well as the library, science lab and others. After the earthquake we are managing the science lab, library, library, and the um, study room, … computer lab, … we don't have the computer, in the new building we are setting, we are going to set up the computer lab, we will set up the computer lab. And, our toilets were not damaged in the earthquake, were not damaged, and now we are putting toilets for our disabled, disabled friendly, and other childs, other normal children.

I: And you will get some roof space as well?

P: … Yeah.

I: Excellent. Other than damage to the buildings, um, how was the school affected by the earthquake?

P: … and that was occurring on Saturday, if that was occurred on school day, at that time there would be, er, primary, 600 children would be victimised by the earthquake. That was our luck that that was when it occur, so our children are not affected, and the school structure, severely damaged, our primary section, our office room, professional training room, library etc. damaged, water resource damaged, water resource also damaged from the earthquake.

I: Did the school have to close for long?

P: Sorry?

I: Did the school close for long?

P: Yeah, yeah, yeah nearly 1 months was closed that time, and children were under, … fright of morality, frightened, morality. And after opening the school after the earthquake, we did some activities, some entertainment activities, to boost up the childrens' morality and to make them be chill, like musical and games also, we did some games, competitions, …. Contest, and different types of activity of, for to the morality of the children to make the …. Of the children. … 2 or 3 children were shocked at that time, at that time.

I: Was the community, kind of, the local area affected by the school being damaged?

P: Yeah, yeah, yeah, after the damage of the building, more of the people, most of the people come inside of the school compound, and making the tent, and they sit, they …, sleep there, sleep there. And after the earthquake we make the Temporary learning centre with the help of [INGO] and Nepal government and [NGO] also.

I: Right

P: With the technical support from [NGO] and [INGO], financial support from [INGO], partnership of Nepal government. We make four temporary learning centre there, you can see that. And … within one month, we will demolish that TLC and shift it to the new school building. At that time, that give us a lot of relief after the earthquake. If [NGO], [INGO] and Nepal government had not provided us with the temporary learning centre at that time, we would be, we will, we would not be able to run the classes.

I: Right

P: *Nepali*

I: So, looking at the reconstruction, this is like a timeline of when different things happened, so when did the school identify that the reconstruction was going to take place

P: 3 months, 6 months

I: 6 months after the earthquake?

P: Yeah

I: And then, was that when the project was set up, or did it take a while to go through the official stuff

P: A few months, from [NGO]

I: Once the project was started, how long did it take to do the design?

P: 16 months. 16 months to construct the building

I: Was, when the design was confirmed did construction start straight away, or did it, were there delays in starting?

P: Late starting, some issues of misunderstanding with, on the land, so we nearly, after the design completed, we started, we started 3 or 4 months after

I: And the construction is almost finished, pretty much?

P: Finished yeah

I: And there are still more to do, but that is ongoing? When is the new building likely to finish?

P: 2 months

I: So, who identified the school, who said we are going to rebuild that school?

P: … To build that school, we approached to Nepal government, and Department of Education, education, education, and [NGO] and [INGO], we call them every time, (?), for their support for construction

I: And then who, did you then start the project, or did they have to agree to help out?

P: Start the project

I: And who funds the project?

P: Funding? [NGO]. School resource also. School raising money, funds, from some Australian people. Australian children.

I: So, like partnered with?

P: Yeah, partners

I: And then, who plays what roles, so what roles did the school play?

P: SMC, school management committee, SMC

I: So the school set up the project? What about within the design, did you get much say?

P: [NGO] designed the project. Engineering, part from [NGO], and part from [NGO]. … Under DPC level from [NGO], and [NGO]

I: And, you said there was technical supervision, was that from the engineers?

P: Yeah yeah yeah, meaning that, frequently visited that.

T: And construction technician was here also

P: Also yeah, appointed yeah. For construction instructor, technician is also, drawing till yesterday.

I: What about the government

P: Yeah the government also, from the DLPIU, District level project implementation unit, DLPIU, also engineer visited from time to time. Um, that chief of DLPIU also visited many times. And, a member of partner, and other, mayor and municipality engineer also visited

I: And was that to do checks, or to support?

P: yeah, Checks

I: What about the community?

P: Community, community is little no, because, most of the children out of valley, and sometimes the parents are visited.

I: Was there anyone else involved?

P: Others? Yeah, political parties and other people also visited, visited and supported to construct the building. And Nepal government authority, like forest, ministry of forestry. We have to cut down some trees there, there were so many trees, 16 or 17 trees at that time. We have to take permission from Nepal government. They give us the permission as soon as possible.

I: The people who built it, were they contractors or volunteers

P: Contractor

I: Excellent. So I filled in some of these. So your main building is bricks and reinforced concrete

P: yeah, yeah

I: and you said the foundations were 11.5ft.

P: yeah yeah

I: What were they made of?

P: Sorry?

I: Do you know what the foundations were made of? Were they brick again, or stone?

P: Stone, stone, yeah

I: Um, You don't have a roof currently

P: Roof, yeah

I: and you don't want a roof?

P: yeah, yeah

I: So that is an open space. Where did all your materials come from?

P: from cement, sand

I: did you, so how did you source your materials? Did you get them from local markets? Were they easy to get?

P: yeah, yeah, easy to get. And we did quotation, suitable quotation and we get that

I: In terms of water, did you use the school water supply?

P: Yeah, we have the ground water and we used that water

I: … And so you say [NGO] controlled the design.

P: Yeah, yeah

I: Did the school have any say, did you get to say what you wanted?

P: Yeah yeah, we give them some ideas, that we needed this building, and they are, we have learnt a thing or two, because, yeah. You can see that this is the school, this is a part of the design. This is the first part, which is completed, and this is the third part, under construction, and the final.

T: The masterplan

I: can I take a photo of that in a minute?

P: Of course.

T: Calendar

P: I will give you a calendar also. We made the supporter a calendar for this part. So if, in your country, some people are interested to support this building, we will put their names in here. *Nepali*

T: the same person did my house as well.

P: And I will send you this design also. I hope that you will tell to your family members and all, to support us with funds

I: Maybe, I am not allowed to offer help unfortunately, but I hope you do get the funding

P: If you can tell to your family and to all those people, this type of school building is there, at [School], it is a community school, and you can say that, it is coming for, to put the third building. …..[xxxxxxxx] [Showing pictures of calendar of pictures]

*** resume interview ***

I: So, when you are reconstructing, you get the opportunity to add new facilities. You said you will get a library, science lab, that you didn't have before

P: Yeah, yeah

I: So you are making some improvements – has there been anything you wanted to be able to do that you haven't been able to do?

P: Yeah, er, we have some, 10 classrooms for now, and we have to arrange for the materials for the classrooms, like furniture, and computers, equipment as well as other types of science equipment, and other types of facilities, we have to provide that. And after that we'll arrange the ……. For the children as well as other personality development programme also.

I: Right, and a few questions about challenges, so, were there any delays in the process, you said there were some delays.

(interruption)

P: He is also the DLPIU engineer, site engineer, monitoring for the building.

I: You said there were some delays before you started the construction?

P: Yeah

I: Why was that?

P: Starting the construction, we identify the place

I: So, was there any, why were there delays starting the construction.

P: Sorry?

I: Why were there delays starting the construction?

T: *Nepali*

P: Due to the cause of the misunderstanding of the land

T: *Nepali*

P: *Nepali*

T: So the land is still with the [NGO]

P: But we get the use rights

P: *Nepali*

I: Were there any other delays? Were there any other delays or not?

P: No

I: No, awesome. And so, for each of these things….

P: Material and quality…

I: were they a big challenge, a little challenge, or no challenge at all

P: In Material and quality, no challenge, no challenge

I: No challenge, they were all really good?

P: ah, good

I: Good. What about labour?

P: Labour, yeah, we get sufficient level of labour

I: any problems of access, getting materials to the school?

P: No

I: No

P: Government process?

I: So things like getting permissions

P: Yeah, yeah, little little

IL In what ways? Just slow?

P: We have to get permissions from local level also, take the permission from different authorities

IL did that, was that a long process, or was it pretty easy, it was just a lot of steps?

P: Yeah, yeah,

I: pretty easy?

P: Yeah, quite easy, yeah. We have to go to propose them, and to take permissions

I: And then, the land

P: Yeah

I: So you had, that was what caused the delays?

P: Yeah

I: And then also the really deep foundations. A little challenge, a big challenge?

P: Little challenge

I: Awesome, any other challenges?

P: No – good

I: You're very happy with it?

P: Yeah yeah, very happy. The challenges are that the children are physically challenged, we have to manage the space, you know, we have to manage different types of materials, different educational materials. To enhance the quality we have to give more provision and more number of teachers from the government. So these are the challenges we have, but in structural, we don't have the structural challenges.

I: Right. You have the TLC, were the children, did that mean the children could carry on as normal, or was there was disruption to the school?

P: Temporary learning centre, yeah, temporary, how to, yeah, to the school, minimise…

I: could the school run as normal?

P: Normal yeah, because the construction site is far from the school

I: right

T: *Nepali*

P: *Nepali*

P: I will search for the person and I will find that

I: and would you change anything about the process?

P: No

I: you were happy with everything? Are there any other hazards that effect the school, floods, landslides anything like that

P: No

I: no

T: just earthquakes really

P: just earthquakes

I: Right. Any other reconstruction in the area, in the town?

P: yeah

I: has that been linked to the school or is that separate

P: Separate

I: separate. Do you know if they use a similar material, or is it the same?

P: the same

I: and then, what has the effect for the school been, being able to be reconstructed?

P: er, effects

I: how has the school been affected, because it has been reconstructed?

T: *Nepali*

P: After the new building, we have the good education you know, the quality education you know, and we have sufficient places, and we can enrol more students and we can provide them with education, and we can upgrade higher level of education also

T: And the targets are 11 and 12

P: 11 12

I: right. Have you got any questions for me?

P: thank you for visiting that, visiting our school, and knowing about us, thank you so much

I: thank you for having me, it's been really interesting

P: I also, very happy with you, you, also [NGO]. At the beginning, [NGO] support for the, to make the temporary learning centre, as well as [NGO] design the building

T: so the bamboo shelter will be demolished after going there

P: after, yeah.

T: were the prefab, were they also constructed after the earthquake?

P: yeah, yeah

T: so they will still be here

P: yeah that will still be

T: and the ones at the back…*Nepali*

P: Demolish it

T: so only the prefab buildings

P: yeah

I: right

P: Thank you for providing us the time, as well as visiting, and we will see also, did you see.

T: *Nepali*

P: what do you feel?

I: I like it, it's a nice school, the children seem really happy.

P: Yeah, yeah, yeah, um, some children from (?) are educated at the bachelor level, for student also, special needs education, bachelor level students also visiting in the school, and while seeing our children are able to help pushing the wheelchair and supporting our disabled children. At that time, they were very happy, and tell me that, we really need this, in our country we are very developed but not caring for the disabled people there and there, but we can see that without the education, able children are also supporting the disabled, and the disabled children are not feeling disabled or, in this way, they are not feeling that. I think that, in my opinion, and sometimes, I am also some proud of them, because I am also disabled, in an accident lost my leg, but I am not feeling I am disabled, I am not disabled. But there are children who are, who have the wheelchair, the wheelchair user children, they are having a lot of problems, physical problems and others, other types of problem, but they are, but in their morality, before their inclusion, they became some worried about who can understand from their faces also. Now, after the inclusion, children are not feeling that, although they are, some, there are a lot of problems here, but they are not feeling such types of inferiority, yeah. Now, I am planning to make the hostel also, for the disabled children, belonging from 75, 77 districts now. In my planning is that, er, I will take one son and one daughter from every district, from the competition of the written exam, as well as, um, an oral exam interview, and we have to give the education to those children who are very brilliant and who will be good in future. And although we have to provide education for all, what we have to do, it is special school one, only one special school in our country

I: Right

P: for the physically challenged

I: right

P: I am planning that, I am thinking that, if you like the hostel, and up to 100 boys and 100 girls, 100 girls, and we have sufficient classrooms at that time, I will sell it the children from going to, different districts of the country, and taking the exam, and finding the really needy children, as well as the disabled children and take them in the hostel, and providing them free education, as well as hostel facility, and give them a good quality education. My aim is that, my aim is to run up the higher education of this school, in the morning time for the bachelor level and in the day time, up to 12, so that I'm working in every facilities, and I am not, and I am not compromised on the quality as well as the funding and the other facilities. My plan is that. Now, I have been teaching in the private college for the bachelor level, financial management since 10 or 12 years. 12 years. And I think that while I began whole at that time, I cannot teach in private college, so I will be the, camp for children here, appoint other teachers here, to do the quality education here – my plan is that.

I: Right. Were many of the children disabled in the earthquake, or was it from before

P: yeah, one boy, one boy went to Indonesia study, for the swimming competition. He lost both of the legs, both of the legs

T: before the earthquake?

P: during the earthquake – pressed, falls down the ceiling, two or 3 or 4 falls upon him, and after 18 hours he was rescued.

I: wow!

P: but his 2 legs was amputated, from his, he is studying in grade 10. He started his studying from 8 and now he is in grade 10, and he is good in swimming. Before that, he left the school and he was working in a guest house, you know, calling the customers at that time, in the bus park, the new bus park area. After the earthquake, he lost both of his legs and started to study. He, I think that he is [age].

T: Oh, wow

P: and now that he is in grade 10, I think that 11, 12 in this school

P/T: *Conversation in Nepali*

I: thank you very much for showing me round

P: you're welcome

I: you know a lot about your school and a lot about the construction.

P: would you like something about us, in our guestbook

I: to write? Oh, I'd love to

P: Then next time you are visiting to our school I will show you. Sometimes I will tell you, send you a message

T: *Nepali*

****end of interview*****

G.9. Case-specific 5

I: … It should be ok I think. I will also….because I also have some specific questions, but any information you do have

P1: Ah ok, sure, I will try my best to answer what I know

I: … So my questions focus on one specific school, but, if like, you want to widen that and talk more generally as well…

P1: Ah ok, that's fine

I: …Of the common factors. So, at one of the schools say, what facilities did the school have before the earthquake.

P1: Well, they just have you know, barely three to four classrooms only

I: right

P1: But then, with only the barely minimum furniture, like even if the kids were say foundation stage, they were sitting on the metal chairs. But like, after the earthquake, nothing was left there for them, so they were actually just … you know, compared to good school, there, they didn't have a proper room to go in

I: Right

P1: So they were just sitting outside their classroom under the sun. … on the … open space. That was what they had

I: Right

P1: So, we, we kind of like, went down there, like you know, was very emotional for us to see all those things, so we decided, like, ok we will do fundraising appeal

I: Right

P1: And then we collect some money.

I: Right

P1: And then, try to see if we can repair the school out there

I: ok

P1: So, shortly post-earthquake, we did the fundraising appeal to all our colleagues and ex colleagues and like you know, … all other partners that we work with in the UK and in some other countries as well. So they, they all donated … everyone of them like you know, wherever we have got contact with, they send us money.

I: Yes

P1: You know, like some send huge amount and some send whatever they could. But then was enough to, … enough for us to, to build a school out there. And we did, … we could have like built,…, about 10 schools out of that money, if we had just built the school that was, that what they usually have, you know, that wasn't earthquake resistant at all.

I: Yeah

P1: You know, we could have built 10 schools, so we decided we rather like build just 3, but like, make proper earthquake resistant buildings.

I: Yeah

P1: Not resistant but resilient, same

I: Yeah

P2: And I think these were the ones which was the worst, like, earthquake struck right. Between one and two of them, and the ones which we chose, they were the worst, of worst conditions, so that's how we chose

P1: Yeah, there were lots of other schools, lots of other schools in the district of Dhading. But then these three schools, we, have, whatever we could see, were the worst one of the what we saw when we, we went out there, so yeah, obviously like, that was really an emotional moment, what you see there. We here, like we have all these buildings, we got, we were not hit by anything, like, no, not for building, we are like, you know

I: right

P1: Cracked or anything like that

I: Yeah

P1: When you go out there, so those little childrens, that we used to go to those schools. First, they are really poor…

I: Yeah

P1: And like, … their parents, … they are illiterate. Their parents would rather be happy not sending the kids to the school, right

I: Right

P1: Now they don't have the school so yes, I'm happy that my kids are going to stay at home and like, look after the, the goats, or like, you know, the garden, the crops, the house, so those kind of thing. The, the parents they know, they don't have knowledge to, like you know, if I send my kid to the school they could you know, learn more

I: Right

P1: and become you know, an engineer, or a doctor or whatever in the future. They would rather like not sending the kids

I: Right

P2: And one of the other things, we, along with the schools that we … helped rebuild. Another thing that we did, we also provide lunch to one of the school.

I: Ok

P2: And that has really helped because …, as, … as [P1] Said, a lot of parents don't like to send their kids to the school, just because, so many of them are poor, and they will want their kids to eat, they would actually send, the school, the students, their kids to the school, so that they can, like, get a proper lunch, you know, which we are helping sponsor over there

I: Oh, ok

P1: So, when we say like, their poor children, poor to like, not able to have food, we, we actually, we almost have like five times meal a day, but then they hardly get like one time meal at home, you know. So this was our gesture, you know, if we could, you know, provide a snack, you know, bit of lunch during the day, the kids would be, prepared to come to school, just to make sure they get some food to eat

I: Yeah

P1: And because they get it for, there, they will be in the school and at least they will learn something. So that's what, is how we are like, trying to convince them…

I: (Overlapping) Oh, I really like that

P1: (Overlapping) … to come to school

I: Especially if you've rebuilt the school, so then at least people will then go to use it

P2: Yeah

I: When you rebuilt, did you build the same facilities as what they'd originally had, or were you able to kind of, provide additional….

P1: we were able to, like, you know, to really, good ones. Like, they didn't, they never had good furniture in there, so when we did the rebuilding, we didn't just do the school, we did the … toilets

I: Right ok

P1: So it was because they didn't have a proper toilet before. And … they didn't have running water in the toilets before so they had a very basic toilet, without any water. And, when we did it, we, … we had to, … you know, take the road for almost 270 or 80 meters long, er you know, so from there we had to take a pipe into the school. And like, you know, we have to bury it underground, and take the water, water pipe into the school, so that, so to make sure they have the running water throughout the day

I: Ok. (Pause) So, the next kind of, few questions are looking at more how the project was set up, … and also a timeline. So, you said, you went and visited some schools, so when, when did you go and do that, those visits, and choose the schools that you were going to help

P1: So, we were hit by the earthquake in April, ok, so I managed to do the first, er visit, er, on the first week of May,

I: right

P1: So this visit was solely to provide them some, er, relief materials

I: right

P1: You know, so, whichever the schools we are working with are down in Dhading, so first we are taught, you know, the kids that we work with, their parents might be struggling out there. So, we went there with like, for three schools we took around 200 relief materials. Which included a very large tarpaulin

I: … [agreement]

P1: A sack of rice, .. and a few kgs of sugar, a few packets of tea, and then hand sanitisers, tooth paste, brush.

I: …[agreement]

P1: … and … what do you call, dettols for sanitisers.

P2: Yeah

P1: So those kind of things we took it to

I: Ok

P2: Antibiotics

P1: Antibiotics. And, like, few, few basic medicines like cetemols and, things. So we took it with us that time. And … blankets was one of the things we took with us, yeah. And er, you know, since we are a school, we are not an aid agency, we couldn't do much in terms of the relief materials, but then, like, yeah, they were all really happy for whatever we could do ok. But our purpose was not to deliver the, the relief materials, it was actually like my reccie to see, like, how badly are they … you know, like … destructed over there. So, like, I just wanted to see, how physically like it is damaged, and then like, what is their, emotional damage to the kids, and then the surrounding people out there. So, and then, my first reccie, which was on the first week of May, and then….

I: So that was before, because there was two earthquakes, there was one….

P1: … no, this was after the second one

I: After the second one, right (Pause)

P1: This was like, just … a week after the second one

I: Ok

P1: Yeah, because there was more worrying. Cause, you know…And then, I came back to the school here, and like, talked to the management here and, like, said, alright, we don't have much money to help out, like you know, lets, just, do some fundraising appeal and see what we can do, and it would be really nice if we could do, like, rebuild the school

I: [agreement]

P1: So that's how we got to, … got the money, and then we start rebuilding it, so … not just rebuilding, we put furniture, we did toilets, running water, and then for the smaller kids, we took the cushions, so they couldn't sit on the floor.

I: Ok

P1: So we did the carpeting, like good carpeting, like, so that, they don't get cold from the floor, in the, from the floor in the winter

I: Right

P1: Or even in the summer. And we did, … solar, … we did the solar power, provided solar power as well. So that they could, run, … fans during the, … summer, like, it really gets, very hot over there during the summer. So which they never had those facilities

I: Right

P1: So now they got the solar power, they could, …. After that, we donated, … speaker, and laptop each

I: right

P1: To the school, so like, they could …, you know, play some, you know, nursery rhymes, or like, you know, like, they could play some you know, cartoons to the kids and things

I: Ok

P1: So that's what we have done

I: So, from when you first went to the school, when did you then kind of confirm the design and, … begin the construction work?

P1: … Right, so once we decided we were going to, … build, … , a building over there, we then consulted with our engineers, right, and then, we did a tender notice, like, you know, tender bidding notice for the consult, … construction companies. They came here, they provided like, few different companies provided us different, … models, like, stuff like buildings and things, which we then had to get approved from the government of Nepal, and …, that was hardest part I would say. …, there was like, our worst experience I would say

I: right

P1: so the government asked us to wait for few time, few more weeks or months, because they were working on the government approved design. But even after waiting for two months, they never came up with any designs.

I: Right

P1: So, …, have, we had to fight like so much, they, they finally approved one of our designs, which was like, really good one

I: Right

P1: But then, the thing is, even after that, like you know, I need this paper signed from that office, you need to get this paper signed from that office, like, sometimes it was like, paper signature and approvals, that we need to get from Kathmandu. And some of them, some papers that we had to get from the place where we were rebuilding it

I: right

P1: So, …, and because, …, you know, they would see us as …, westerner, or aid agency, though we were not

I: [agreement]

P1: …an aid agency. But then they would say, oh, you guys are aid agency, you have lots of money, oh how much money have you got, and all those things

I: right

P1: This like, put, the people who were into (?) and things, they were like asking so many different, random questions, like, and then, how many, and I didn't mind answering their random questions. But the thing is, those questions were …, kind of, trying to, like, you know, stop us moving ahead, some of them are like that. So, there was pretty hard time over there.

I: [agreement]

P1: But like, yeah, it's cause we were you know, we were doing it for their community and then, like, it was nothing for us. So like, yeah, we fought it well, and then, like, we finalising it. So …, took just three months for us to get our construction designs and things sorted out, but then, it took another four months to get the approvals and things sorted from the government

I: right

P1: There was seven months already, and then, in five months time, not, five, for this, next, six and half months time, we finish the construction as it was. So, it was about, erm, 13 months time in total just from the day we discussed like, if we could you know, start building the, the school for them

I: Right. So construction took 5 months you said?

P1: 6 and half months, actual construction 6 and half months

I: ok. And why did you go to that specific area? Had, [Name] said that you had previously worked with the school

P1: Yes, …, our sixth form students were, …, involved in those schools previously as well, before the earthquake as well. They used to go there once a year for a week to do their, you know, community work thing

I: ok

P1: so we, we had, that attachment there and then because we, we had been working with them for, er, the last five years before the earthquake, four years before the earthquake and then, yeah, there was the emotional attachment we had with those three schools down in Dhading

I: [agreement]

P1: So we, we, we then like, when we see it, like, you know. There were other schools nearby that were hit by the earthquake but then, you know, it couldn't just jump out somewhere and then leave the school you were working with

I: yeah

P1: So we thought, you know, rather like sort out our problem first, and then like, look into other things.

I: Ok. …, and then, so in terms of the project roles of what the different groups did. So the schools you were working with, did they have much to do within the project, did they get say in what facilities were provided?

P1: …, well, like, because the money wasn't ours, it was donated to us by like you know, many people, who really wanted the school to be built. So we had a clause with the schools that we will be doing everything, but like, you know, because it is in the middle of forest, it is in jungle, so can they provide the woods that would, that we need for like, you know, building the doors, and like, windows and things, you know, which they agreed for. So they provided us woods from the forest

I: Right

P1: Which we, we did have to, you know, pay for the cost of cutting it, and like, you know, working it, you know, to the carpenter. But like, at least we didn't have to buy the wood, so that was one of the things. And then …, … the, we are, building we made required some stones as well, apart from the brick, we required some stones as well and then, …, the, the stones were from their local river so they (?) actually gave it, to the project for free

I: Ok

P1: So there was …, there was a partnership we had with the locals, communities out there

I: Right ok

P1: So yeah, we wanted to make sure like, you know, they feel like, they feel they have the ownership of the school as well. It's not that the school is going down there and we are building it for them. We wanted to take you know, take them the ownership of the project as well, so we asked for stone and wood.

I: So that would have been the school and the community as a whole

P1: Yeah, so, whenever we say the community as a whole, you know, not all the parents could come, but a few of them who could, they, they really helped us out there

I: Ok.

P1: Yeah

I: and then, your design was done by an engineering firm?

P1: Yeah, our design was done by an engineer firm, engineering firm called [Engineer],

I: Right

P1: and yeah…

I: [Engineer]

P1: [Engineer]

P2: But actually, they follow the same design which …, one of the [organisation] has given them, which is the [NGO] designs.

I: Yeah

P2: and it's like, all the three schools are like, similar design which, like the main template is from [organisation]

I: Ok. … and then the people who did the actual construction work, were they community volunteers or were they contractors, …, who did the, who did the labour?

P2: Contract work

P1: Ah, is er, after the engineer did the design work, we then had to hire contractor

I: Right ok

P1: So, it was the contractors job to like, give the, you know, labours and things. But then, we kind of agreed, er, with the contractor that, they are not taking any labours from Kathmandu

I: right

P1: So they will have to find labours in the Dhading

I: Ok

P1: So the local people get some kind of, you know, opportunity, you know, some kind of job out there, yeah

I: So did the local labourers, did they require much training or anything, or was that…

P1: (Overlapping) …, yeah, it was kind of on the job training, like, you know, so they were trained as they were like, building it as well

IO: Ok

P1: Yeah, so, you know, like, we, …, our contractors were limited to certain things, like, you know, …, they couldn't get the skilled labour out there, so they had to take few from Kathmandu here.

I: right

P1: But then, non-skilled was …, here, like, they made sure, like they hired it from Dhading only

I: Right

P1: So, and like, I was overseeing the project, so, I made sure, like the locals are getting some kind of, some sort of jobs there as well.

I: Awesome. You briefly touched upon stone and timber. How, what was the main structure built from, what materials were used?

P1: …, it's …, it's RCC, like, rods cement and concrete

I: Right. (Pause) So was that an RCC frame with infill walls, or….

P1: (Overlapping) Yes, RCC frames with the infill walls, like you know, the walls was the brick

I: Right

P1: Brick, but then they used the lintels and the things that made sure, like, the height of the wall is not too much, before it's like, before it had the proper tying or something, you know, I don't understand, like, I haven't got much idea whatever was done, you as the engineer would know that.

I: yeah. And, the foundations, what were the foundations made from?

P1: …, the foundations we, … like, the digging the foundation and then like, the main foundation was the, …, stone, er, concrete again and like, much cement.

I: Right ok

P1: along with all the rods and things for the pillars you know, even for the pillars they do the rods and things. So … there was, there was, there was a, like, full of, I would say, (?) proper permanent structure, proper permanent, not like, you know, the temporary one that would last for a few years

I: [agreement]. And so that stone that you mentioned, that was the stone for the foundations?

P1: That was the stone for the foundations

I: Ok. … , and then what was the roof made of?

P1: Er, the first floor was the, er, was total concrete

I: Right

P1: And then, the, no, both floors are concrete actually yeah. Both floors are concrete.

I: …, and then the cement and the steel and the bricks, where did those materials come from, did you have to bring them from Kathmandu or was there a local…market

P1: …, no, we, had to, some of them we could, like cements, …, and sand, and what do you say, jute(?), few little things like sand cement and things, we got it from the local market. But then, that was er, there was a really bad time for the country itself. We were, the, we had a border closed from the Indian side, so the Indian border was closed that time. So not, we had to, like, you know, pay at least three times what it would cost normally for the same amount of sand, same amount of cement we had to pay, like you know, three times, at least three times as much as what we would normally pay

I: right

P1: And then, like few of those rods and then you know, steels, we had to get it from a place called Chitwan, so you know, to get it transported, feels like, we had few crises that time because of the border closing. So …, the fuel was like, the fuel price was like five or six times what we, what it would normally cost, so it was very difficult to get the, get the things transported to the village out there.

I: right

P1: So, it was a really tough thing, until, like, but that was nothing to do, you know, nothing to do with the project, but that was the, you know, the political condition of the country itself. And then, that was the, few of the political small thing, issues did happen during the project time, at the construction area. Like, you know, some of the, 'I'm from this party, you guys never told me that you are building it here, where did you get the money, how much have you got, like, where is it going, how did you get it, and all those things'. And, our problem was, I mean, I did say, on their face, like you know, it's none of your business, like, you know. We got the money, like you know, from some good hearted people, wanted to you know, make a, build school here, they donated, so like, you know, we will, we will make sure, we will build a proper school.

I: yeah

P1: Your job is to monitor us doing it. You know, we don't do a good job, like, the (?) can always come to us and say, oh you know, this is not right. But thing is, as long as we are doing right thing, you know, and then, I didn't want to (?) the government to stop us doing it.

I: Yeah. So, for the actual design, was it two stories?

P1: It was two stories

I: Two stories. And, … how big is it, how many classrooms is that?

P1: Two, … two classrooms in each floor, so four classrooms. But then, as we were building it, cause like, we had the, … as we were building it, like, you know, underneath the stair, so they wanted us, to make some extra room underneath the thing so they could store it.

I: right

P1: Which was a good thing you know, they asked for it. We, it was never in our design, but then, cause like, we never thought about the storage thing, but then they asked for it. The school asked for it and then we made the storage area underneath the stair

I: Ok. And so each school was just one building, it wasn't separate blocks or anything?

P2: Yeah

P1: It was one building

I: one building

P1: Which is school. Yeah. But then, all three schools are identical to each other

I: Right, ok

P2: same design

I: Yes. Ok. And each of them were rectangular

P1: Yes, rectangular

I: as well as the, you mentioned the wooden beams, like the concrete, lintels and things,

P1: [agreement]

I: were there any other features that made it more resilient?

P1: Well, er, we did discuss it you know, in our, like you know, when we were consulting with our engineer. They said, because we are putting these things, and this is going to reinforce, you know, the strength of the thing, the structure more, and like, I will be able to explain what it is, but what I know is, lintels I understand, so then, just this kind of thing. They did, they did, they were saying this is the size of the steel we are putting in, so this is going to like, you know, increase the strength of the building, so because we are going this thick, and we are using these materials, so this should, …, you know, …, you know, …, hold at least certain amount of …, seismic movements, so those were the things that we discussed with the engineers, and we are happy with what they said that time.

I: And he explained that to you, which is…

P1: (Overlapping) Yeah, they explained it to us. And like, I wouldn't be able to, like, you know, technically to you now, but you know, you know the, the depth of the foundation that they were going, you know, this will make the structure more than enough strong and things like, engineers did, …. you know, explain it to us. And then we hired the contractor, and like, this engineering company were supervising the contractor. So like, we are, it was not just the contractor doing their job, and like they are on that job, but then it was the engineer, our engineers was actually supervising it as well

I: Right

P1: And then, I would go there to like, …, to supervise the project, like you know, just in case like what's going on, and how far have they gone, but I would never, I would have no understanding of what like materials were being used and then like what would be the actual ratio of cement and sand

I: yeah

P1: so, I was not, those things, right, so like, just to make sure like those, things, were correct we had our, you know, we had engineer supervising the whole project

I: Was there any work aside from the actual structure, to make it safer in an earthquake?

P1: …,

I: That you know of, …

P1: (Overlapping) Yeah, we had to flatten the land

I: right

P1: So, we have to use …, some big diggers up there, to like, flatten the land, and the retaining walls on the side of the hill, so we tried to like, you know, flatten it as much as possible, to make it like safe from the landslide. We did, we did test the soil as well, we did do the soil test as well, but we actually build it so, so like, you know, just after the building is completed, we didn't want any landslides taking the schools away. So we, we did the soil test as well

I: Ok. (Pause) we've kind of covered these in a little bit of detail, but just a few questions about the challenges that the project faced. So, you mentioned that there were some delays with getting the design approved and things like that?

P1: Yeah, so was like, from the government. The Nepal government, it is a bureaucracy, the bureaucracy is like, you know, so, so difficult. … Because we are not asking for any money, we are just asking for them to like, get the design approved. Either, approve our design or give us your design, like you know, you could build a school from. And that time, they didn't have …, any approved design from the government itself, and they were not ready to approve our design as well. So that took quite a while

I: Right

P1: And like, after the, after the design was, you know, finalised, the paper works, like you know, we have to, we had to, and like we have to go through different ministries and different level of offices, getting signatures, there was quite a hectic job. Not just because we had to go to 10 people, but then we would like, we used to get at least 100 different answers from those 10 people, you know. They would just like, 'this is not, you are not coming here, you have to go to number 2 first.' Alright. ' Oh, you haven't gone to number 1, why you here?', ' but they just said come here', 'oh, no no no, I can't do anything for you', and then like, then you go back, 'oh right, they did not tell you to go to number three first, no, ok, go to number three and then come back here again'. Come on, like you do it, and then, like, you know how, like, you go on there, other groups (?) so slowly. But they, they won't do it, and that's how the bureaucracy was.

I: Right

P1: Which is still here, like, and this is finding pretty difficult. They are trying to build another school and they are still struggling to get the approval. That's been almost 2 years now.

I: And that was a big problem for the…

P1: (Overlapping) Yeah, it was a big problem for, the, you know, because, I, I am work, like, I am an IT engineer and my job is not, like actually looking after those things. As we are not aid agencies, like you know, we just a school and we are trying to help out you know, …, these like, community schools to have their own school. So we were not, not an expert in ourself dealing with these kind of things, so yeah, it was a big challenge for me, and like, you know, it was like, great battle that like, you know, that took me four months to complete.

P2: It's like, the government issues a very ongoing thing and …, for a, as he said, like we had, we had to go so many different offices and meet so many different officials, and get things approved, and then, now we have another government just formed, and now everything is, now we have to do everything from scratch again

I: Right

P2: So, it's like, like such a huge task, which shouldn't be, but yeah, like, government is not supportive as well

I: Right, ok.

P1: Apart from the government, even the local people and the community, …, they are, they are supportive, but then, those people linked to it, …, some political parties in, you know, that community are the one that would come and stop you to, and go ahead and do the projects.

I: Ok

P1: I am, like, you know, we work, meant to have like, … hundred, we are more then like, hundred and fifty different political parties. Right, in a small you know, village up there. Say one of, you know, one of the persons just comes up there and 'hey, I heard you are building a school?', 'yes, yes we are', right, 'oh, why didn't you let me know, I am the, you know, the local leader from this party', 'oh, sorry I didn't know you', 'yeah yeah, so now you know it, you are doing it', 'you must be very happy that we are doing it for you?', and like you know, and we are not asking for any money from the community, we are doing it from our money, like we are not asking for any money from the government as well. 'oh, you must be very rich then because you are building a school here, how much money are you going to invest?', and all these things.

I: Right

P1: You know, so their interest would be like, …, you know, they could get some like, you know, rupees

I: Right

P1: you know, just for tea money, for nothing. It is for nothing, just because they belong to some political parties. … You know, they won't demand it, but then, they would, … hassle us during us moving ahead with the project, which means, yes you are asking for some, some yeah…

I: (Overlapping) And that, was that as big a problem as the major government problems?

P1: …, that was, its, … problem of the country actually like, you know, it's a bureaucracy and like, there's political leaders in the villages are also like super like that, so, it's all those corruptions that's happening throughout the country

I: [agreement]

P2: If like, the government itself was strong for us, like, we would be protected, and things would not be delayed, but since our government is not strong, as, and as he said, we have so many numerous, like government parties, so it's kind of like, hard to like, satisfy each and every one of them, you know

I: Yeah, there's a lot of hoops to jump

P2: Yeah

I: Did you have any problems with kind of, the quality of the materials, them being available, you said they were really expensive because of the…blockages…

P1: Yeah, we did have …, problem with the you know, supply of the materials, but just to make sure we get the … the quality that we were looking for, which we initially discussed with the engineer, and like, with the contractors in the design phase. So we just to make sure we get all those quality things we were happy to pay, like you know, double or three times the, what it would normally cost, because of the blockage and things. So we'd rather paid more money than compromising on the quality

I: Right

P1: Just to make sure like, whatever we build, we build a proper one.

I: What about the quality, what about being able to get the materials to the site, was there problems with accessibility, and transporting materials.

P1: Transport like, because of the blockage again, like you know, there is no fuel. So we had … very big fuel crisis that time, because all our fuels come from India. So … so we couldn't get trucks to, you know … carry our bricks to the site, like, we didn't have trucks to carry the sands and cements to the site. We didn't have trucks like, you know, we couldn't have, we, it was very hard to find trucks to, get our like, steels transported to the site, so … that was a huge problem that time, we had to face. Normally, under normal political situation like this, you know, now, they, would have been so much easier. Our project would have been finished in about four months time

I: Right ok

P1: That took like you know, six and a half months up there.

I: Right. So for the current schools you are building, or the current one you are working on, that's not going to be as much of a problem?

P2: Er, with the fuel probably not so, and getting the material probably not, so, it's just transportation to the school, because the road going to, the, the specific school that we are working in, like, it's a bit difficult, like, it's not appeared yet

I: Right

P2: so that will probably be the only difficulty. Also, like the reason why we didn't want anything to be done during the rainy season was also because road could be like, destroyed during that time, yeah

P1: Even with the like, big tractor they can't … go up there.

I: Yeah

P1: and then, carrying materials with helicopters, like, it's impossible, yeah, when it comes on to the money, it's going to be like so expensive, you can't even imagine, so that's the biggest problem out there.

I: So you avoided constructing during the monsoon?

P2: Yeah, definitely

P1: But like, that's the, local level problems, and those things, I would say … you know, that's, we could fix it by just waiting a few months to get the roads dry and things, right. But repairing roads, as we discussed earlier. This has been (?) almost two years now, so she did all the paper works, right, and then, everything was like, good to go ahead, just about, we were like saying, to go for tender, of, for the quotations of like the engineers and you know, the contractors. And then, the, they formed the new government and then the whole system in the country has now changed, right. Now she has to do it from the scratch. So, I knew, we never know, by the time she does it again, and you know, and she try to go out there, it could be a different bureaucracy happening out there again, so you never know those kind of things. So, …

I: (Overlapping) Keeps you on your toes. … What about problems with … the skills of the labourers, did that cause any problems, or was that kind of, taken in by the contractors?

P1: … That bit is taken care by the contractors , like we don't really, don't really need to worry about that.

P2: For us the massive problem as we mentioned is, just the government and once that is sorted, then everything is, pretty simple, not during his time…

P1: (Overlapping) And the community

P2: Yeah

P1: The local community is a problem as well, you know, like, they tried to come to the construction site and go ‘I didn’t know it’ or ‘you can’t go ahead with the construction work’ or ‘show me your license and things’, or ‘show me your approval’. And, I would be carrying like, all those documents with me all the time, like, you know, when I am hiking one and a half hours up the hill, up there, like you know, when the construction is happening. I wouldn’t necessarily all the documents, but then, I would be carrying it every day out there, and then someone would just turn around up there ‘where is your approval documents’ and things like, yeah, they do try to like, you know, stop the project, and (?).

I: Ok, … the land that the schools were built on, was that the same site as the school was previously built on, or did you get a new site? And was that difficult to arrange?

P2: It’s the same school, same land

I: Right. … You were going to change anything about how you’d done the process, would you do that, or were you happy with how it went and it was just that those problems, you would have faced anyway?

P1: Well, apart form the problem that we had to face with the bureaucrats and like the government political situations, and like you know, fuel, or, ones from the community itself. Rest of the process we did, was the professional at international standard things, so we don’t need to really, and like, we would be more than happy to like, follow the same procedure

P2: Yeah, so we are actually going to follow, how he did before. It’s just the government, we wish we could control the government and just get the signature done

I: everything would be so much easier

P2: But we are just going to follow however he did it

I: Brilliant. My last few questions just give me a bit of detail about where the school is, and erm, how easy it is to get to and things like that. So, Dhading is 90km from Kathmandu.

P1: It’s about 90km from Kathmandu

I: And how long does it take to get there?

P1: Er, 3 and half hours

P2: 3 and half…

P1: And the, like, lets say, like, there’s a town, tourist town there, er, takes 3 and half hours. So our site is not in the town, we have to walk up hill

I: right

P1: Because the local transportation there is like, you know, we can’t reach up to our site in like 45minutes or an hour time, or an hour and half time. But if you have to wait for the local transportation you will end up like waiting for, for the bus for the whole day

I: Right

P1: So the….

I: so there is vehicle access but it is…

P1: (Overlapping) There is vehicle access but it is very limited

I: Right.

P1: Unless like, you take your own 4wheel car and things

I: Right, ok. And are those roads good quality

P1: … no!

P2: No

I: No

P1: very scary.

I: the, road to the town is that along the highway, or, is it a bit of highway and then…

P1: (Overlapping) It's a bit …, it's a bit, outskirt of the highway, like, it's on the other side of the highway. But, it does have, you know, black top, you know, until the main city, called [City]. Then, from [City], like you know, we've got these three projects are like, one two three,

P2: (Overlapping) All on different side

P1: (Overlapping) north from the town, on toward, on the east from the town on towards the west from the town. So, like, it's in, all three different, are like. The one that we would be working would be like, on the other direction, so there would be four different directions are the schools we are working with

P2: Even when I last time went, because I was so focussed on one school, I couldn't go to other schools, because like, I didn't have time to finish it in a day. So, it's like that far, opposite directions

I: right. Ok. And so the road to the town is good, fairly ok

P1: yeah, until, to the town is good, but then, from there … I normally like, you know, if I have to visit all four schools in a day and then like, if I'm in rush, then I normally take four-wheel car and then do it, but if normally … if I am there for a week or so, I don't trust going on any vehicles out there, I would be like, happy to hike up to the sites, because…

I: (Overlapping) Right. … Are there any other hazards that affect the areas of the schools, you mentioned landslides, so you cut the slopes…

P1: (Overlapping) Yeah, landslides could be one, but then, like, to minimise the landslide, like, we did, er, dig the land, and then like, tried to make it as flat as possible. And we did do the soil test as well. With natural calamities, you never know, like you know, so, …

I: Ok. … Was there any other reconstruction work that was going on in the community, or in like, surrounding communities, and were you able to link with any of that, or was it completely separate?

P1: No, it was completely separate. But then … it was a bit difficult to find the local labours at that time, because all their personal houses were destroyed as well, and then we were trying, there, best to rebuild their own, like, you know, (?) as well. So you know, so many of them were trying to make their own houses … it was a bit tough time to get the local labourers. But then, we managed to get it, and the contractors, it was the contractors problem, he sorted it out.

I: Did the contractor use the same labourers on each of the four sites, or were they different on each one?

P1: Because all three sites were constructed simultaneously like, you know, so they had to use different labourers

I: Ok. … my last question would just be, what affect has rebuilding the school has had, had on the local community and the school?

P1: Well … there's a bit of, there's a bit of political dispute after the rebuilding. The community people thought the principal of the school got a lot of money from us. And then, from that money, she built … two storey building with four classrooms, but then, we, she, the principal had actually got money that was enough for eight classrooms or so, so those were the things that we had to go down there and clarify it. It was er, local communities how we got the money, and like, how we the school was built … you know. We had to explain the whole procedure to them, during the inauguration. We had an inauguration ceremony there, so we invited all those political party people, and we invited all those, you know, people living in the community and like, (?) like, was almost 20 minutes speech. 20 minutes speech explaining them you know, how we got the money, you know, how was the reason behind rebuilding the school and how we got the money, and how much we spent on it and things, how did we work towards it, you know, I was talking to the local communities throughout the time, you know, throughout my speech there. So, but like, they thought like, because we … the principal were from a certain political party, and like, the principal had connection to foreigners, westerners and the other one didn't have, there, they were trying to rationalise it in a political way, rather than in a, it was a community thing, and it came from some good heart from around the world. … They didn't want to … believe us telling them, it didn't, the money came from like, some good hearted people for them. They didn't want to, they rather thought we were an aid agency and we have lots of money coming out there. And some of them might be saying, oh, this guy comes here into the village, you know, he is the one to like supervise all the building, he must have lots of money under the pocket and all these things. But it was like, off for the people to let me get on the stand. We had this meeting and like, we sorted it out.

I: Ok. Brilliant, thank you so much for answering all those questions.

P1: Ok

I: Very grateful!

End of recording

G.10. Case-specific 6 (online questionnaire)

Entry #	1
Date Created	2018-11-23 17:05:25
Date Updated	
IP Address	[IP Address]
What is your link to the reconstruction of this school?	I have been construction manager for 2 schools in Ramechhapp district
Name of school	[School]
Location of the school (Village, VDC, District)	[Village] Ramechhapp
Number of students	90
Number of classes	6 plus one common room and one teacher room
Number of staff	around 20
Age range of students	grade 1 to 9
What organisations have been involved in the reconstruction of this school?	[NGO] [NGO address]
Before the earthquake -- Classrooms -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Damaged in the earthquake -- Classrooms -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
After the reconstruction -- Classrooms -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Before the earthquake -- Offices -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Damaged in the earthquake -- Offices -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
After the reconstruction -- Offices -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Before the earthquake -- Library -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Damaged in the earthquake -- Library -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
After the reconstruction -- Library -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Before the earthquake -- Hall -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	

Damaged in the earthquake -- Hall -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
After the reconstruction -- Hall -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Before the earthquake -- Computer labs -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Damaged in the earthquake -- Computer labs -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
After the reconstruction -- Computer labs -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Before the earthquake -- Science labs -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Damaged in the earthquake -- Science labs -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
After the reconstruction -- Science labs -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Before the earthquake -- Toilets -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Damaged in the earthquake -- Toilets -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
After the reconstruction -- Toilets -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Before the earthquake -- Hand washing stations -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Damaged in the earthquake -- Hand washing stations -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
After the reconstruction -- Hand washing stations -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked

Before the earthquake -- Outdoor areas -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	Checked
Damaged in the earthquake -- Outdoor areas -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
After the reconstruction -- Outdoor areas -- On the grid, please identify what facilities the school had before the earthquake, which of these facilities were damaged in the earthquake, and what facilities the school has, or will have, after the reconstruction has finished.	
Please give details of your answers selected above. This could include details such as the number of classrooms, how badly damaged the buildings were, and any work that had been done before the earthquake to improve the buildings.	The original building was taken down. New buildings rebuilt on same position due to site size
The school had to close because of the damage	
A Temporary Learning Centre was built so lessons could continue	A Temporary Learning Centre was built so lessons could continue
Children dropped out of school	
Staff and students were traumatized by the earthquake	
Other	
Parents not able to work, as they need to look after the children	
School was able to provide shelter after the earthquake	School was able to provide shelter after the earthquake
Donating funds to rebuild the school	Donating funds to rebuild the school
Children not in school so able to help at home	
Other	
School identified to be reconstructed	Apr 26, 2015
Project started	May 05, 2015
Confirming the design	Jan 15, 2016
Construction work starting	Dec 16, 2016
Construction work finishing	Mar 20, 2019
School reopened	
Please give any additional details about the time scale of the project, that you think may be relevant.	Please note: NGO was already present in the village with other educational projects. Construction was on hold for most of the period mentioned above. Effective construction could be estimated around 7/8 months but several interruptino and lack of manpower effected the timeline.
How was the school identified to be reconstructed?	NGO was already present in the village with other educational projects.
Who started the project?	[NGO] with local community.
How is the project funded?	Funding done in Switzerland via various sources: private donation, foundations, national donors
School / School Management Committee	legally is a partner in the construction. every decision made by them in consultation with NGO
Non-governmental organisations (NGOs / INGOs)	Funding and project management
Engineers	site supervision and management
Labourers	construction
Government	design approval, site visits (2) during the project, requested monthly update

Community	part of the work was contracted locally
Others	external work force
Foundations -- Fired bricks -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Fired bricks -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Fired bricks -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Stone -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	Checked
Main structure -- Stone -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	Checked
Roof -- Stone -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Compressed earth bricks -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Compressed earth bricks -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Compressed earth bricks -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Earth bags -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Earth bags -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Earth bags -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Reinforced concrete -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Reinforced concrete -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	Checked
Roof -- Reinforced concrete -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Un-reinforced concrete -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Un-reinforced concrete -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Un-reinforced concrete -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Timber -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Timber -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Timber -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	

Foundations -- Bamboo -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Bamboo -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Bamboo -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Steel sections -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Steel sections -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Steel sections -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	Checked
Foundations -- Sheet metal -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Sheet metal -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Sheet metal -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	Checked
Foundations -- Cement mortar -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	Checked
Main structure -- Cement mortar -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	Checked
Roof -- Cement mortar -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Foundations -- Mud mortar -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Main structure -- Mud mortar -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Roof -- Mud mortar -- Please select all of the materials that have been used within each element of the reconstructed buildings. Choose all that apply.	
Other:	
Please give any additional details of the materials used within the reconstruction, including where the materials were sourced from.	Solid wood (sal) for windows and doors. Stone sourced locally Sand from Manthali Steel and cement from manthali vendors
Number of buildings	4
Number of floors	1
Number of rooms	7, plan can be provided
Shape of buildings	linear
Bracing	
Ring beams	Ring beams
Lintels	Lintels
Regular layout	Regular layout
Small window openings	
Through stones	Through stones
Other	
Accessible ramps	Accessible ramps

Hinges flat against door frames	
Doors opening outwards	
Two sets of doors	
Open-sided benches	
Other	translucent roofing coverage, clerestory roof with additional windows and ventilation
School	School
NGOs	NGOs
Engineer	Engineer
Government	Government
Community	Community
Other	
Please give details of why the materials and design were selected.	stone locally available, cement reinforcement by government rules, solid wood by school choice and common practice, roofing material by gov. standard
Reconstruction can provide an opportunity to upgrade facilities. Was it possible to make any improvements from the previous structure, and if not, what prevented this?	Roof section has improved (clerestory roof) light and ventilation. Internal finishing has improved.
School identification	
Project initiation	Project initiation
Completing the design	Completing the design
Starting construction	Starting construction
During construction	During construction
Re-opening the school	
Other	
Please give details of what caused any of the delays identified above	in the initial phase NRA was not yet established, design approved slowly, lack of manpower, logistical problem, condition of roads, other social events took local workers away, reconstruction of private houses, blockages, elections
Material quality / availability -- Below are some challenges that have affected other school reconstruction projects. Please rate each of these based on how they affected the reconstruction of this school, as being 'no challenge', a 'minor challenge', or a 'major challenge'.	Major challenge
Skill / availability of labour -- Below are some challenges that have affected other school reconstruction projects. Please rate each of these based on how they affected the reconstruction of this school, as being 'no challenge', a 'minor challenge', or a 'major challenge'.	Major challenge
Accessibility and transportation -- Below are some challenges that have affected other school reconstruction projects. Please rate each of these based on how they affected the reconstruction of this school, as being 'no challenge', a 'minor challenge', or a 'major challenge'.	Major challenge
Government process -- Below are some challenges that have affected other school reconstruction projects. Please rate each of these based on how they affected the reconstruction of this school, as being 'no challenge', a 'minor challenge', or a 'major challenge'.	Major challenge
Community involvement -- Below are some challenges that have affected other school reconstruction projects. Please rate each of these based on how they affected the reconstruction of this school, as being 'no challenge', a 'minor challenge', or a 'major challenge'.	Major challenge

Land availability / suitability -- Below are some challenges that have affected other school reconstruction projects. Please rate each of these based on how they affected the reconstruction of this school, as being 'no challenge', a 'minor challenge', or a 'major challenge'.	No challenge
Please give details of why you have selected these ratings of the above challenges, and identify any other challenges not mentioned.	mentioned above.
Were any steps taken to minimize disruption to the running of the school, during construction?	the school had temporary shelters built quickly after earthquake. classes were not stopped
What actions, if any, were taken to overcome any of the challenges faced, either solving challenges, or preventing challenges before they occurred?	intensive research of manpower, negotiation with local community and contractors on many factors
Is there anything you would change about the process, in order to improve it, if it were repeated?	better define the contract between NGO and community especially in community involvement and contribution. A quick feasibility study, especially on the provision of stones would have been helpful.
Please give details of how easy it is to reach the community and the school, such as how far it is from Kathmandu, how far it is from a main highway, and the quality of the roads.	From kathmandu - Sindhuli highway till Manthali (4h) well built road. From manthali stone paved road for 3 hrs to Dhobi. From Dhobi 1h unpaved poorly carved road till [Village]
Flooding	
Monsoon	Monsoon
Landslides	Landslides
Other	
How do these hazards affect the community and the school, and what steps, if any, are taken to minimize the risk of them?	Road from Dhobi gets blocked. This year some additional retaining wall has been built
Houses	Houses
Health centre	
Community centre	
Other schools	Other schools
Other	
Involvement from the same organisations	Involvement from the same organisations
Using the same materials	
Training for labourers and community members	Training for labourers and community members
Other	
Please give any additional details of the links identified above.	[NGO] gave technical training to 90 masons in the village and technical support to the families during reconstruction. As per july 2018, around 450 (70% of eligible) house holds have been rebuilt
What has been the effect for the school and the community, now that the school has been/is being reconstructed?	the school was existing before so it brought things back to situation pre-earthquake. The expansion should provide better facilities.

G.11. Complementary meeting

I: … So, most of the questions are kind of, more focussed towards reconstruction, but equally, the temporary learning, the transitional…do you call them transitional or temporary?

P: … Actually, there are two terminologies which we use, from initial stage to, up to now

I: [Agreement]

P: There are two terminologies that we use

I: Right

P: TLC we call it, in the beginning, temporary learning centres

I: Right

P: which are more temporary and which were actually, from local materials like bamboo structures

I: Right

P: And some type of wooden, … materials, … depending upon the, … topography, depending upon the availability of materials

I: [Agreement]

P: There are lots of local materials used at that time. These were called, … temporary learning centres. And later on, for when constructions were planned, … or in the process of planning, … Nepal, or we, feel that, … temp…permanent construction will take lots of time

I: [Agreement]

P: and at the mean time, we need some kind of transitional structures

I: [Agreement]

P: and then it was developed actually

I: right

P: and these were, these were proposed or planned, for at least 3-5 years

I: For how long they will last?

P: But according to the structure, it lasts beyond 10 years

I: Right

P: Yeah. But it was thought that, at least 3-5 years, it will be used

I: Right ok

P: … So, from the beginning I can just brief, the background

I: Yeah

P: Where we get earthquake, immediately after that, actually I will be talking about some technical terms, even some … general terms also

I: [Agreement]

P: Like, … from the beginning when earthquake occurred, at that time, all the NGO, INGOs along with the government, we, we … gathered and … have a, had actually a rapid assessment

I: [Agreement]

P: Rapid assessment of all those structures, with developing some checklist

I: Right

P: which is, which is quite, … easy to understand and normal technical people can do that actually

I: [Agreement]

P: Because there were rating general terms, even with technical connected with technical terms, they were very general and even normal people can, can identify those criteria's at that time

I: Right

P: Like we, in the rapid, rapid assessment, … there were 3 categories of buildings, which were affected by the earthquake, and … and they were actually, … the structures which were completely damaged these were categorised as red with a sticker, and some structures which were, … partially damaged, and can be used after some maintenance, very minor maintenance, then these were categorised as yellow structure, yellow stickers, and third one is green sticker, and these were actually not much affected, very minor cracks, non-structural cracks

I: [Agreement]

P: These were categorised as, … as green stickers. Accordingly all those, earthquake affected districts and schools were categorised. Depending on that, … actually, initially the CFS, we call Child Friendly Spaces, these are very temporary structures, to, to collect the childrens,

I: Right

P: Which were affected, and which were, … traumatised at that time

I: Right

P: These were collected in the CFS. … and they were, … there were lots of, … fun activities, to, to, …

I: Right

P: What do you say, … to forget them

I: Right

P: The event itself

I: Yeah.

P: And, … principally CFS were, … were supposed to, to end up to 3 months,

I: Right

P: But, in our case, they were even after 6 months, because there were no any TLCS constructed, constructed in some places

I: Right

P: Although in some places, … some INGOs immediately started construction of TLCS

I: [Agreement]

P: immediately after the CFS

I: Right

P: Then…

I: And how did the construction of those two differ?

P: Actually construction wise, CFS were very temporary like, some tents, using some tents, some tarpaulins, … those temporary, very temporary structures

I: [Agreement]

P: yeah, structures were not for construction?…actually in those CFS's, although in TLCs we designed it, depending on the locations, depending on the, … availability of material. TLCs were, … actually designed

I: Right

P: To last, … at least up to 6 months. It was, supposed to be out, … of use, after 6 months, but you can, even now, you can, can see some TLCs

I: …

P: It's been 3 years, after earthquake but we can see some, those Temporary structures up to now, because our permanent construction is very low, very slow actually, not low, it's very slow

I: …

P: so, yeah, it's … in some places TLCs are, and permanent construction were parallel going

I: Right

P: Because many rural places where all the NGOs or government, even government couldn't go at that time, due to the transportation, transport, accessibility. We could not transport all those construction materials up to those schools, so permanent construction, even now it is very difficult to conduct in those places

I: yeah

P: and government is planning to construct permanent construction depending on some criteria's. Actually, criteria's were developed from the beginning of the earthquake, for the TLC construction, even for those there were criteria, there were criteria for selection

I: Right

P: Like, damage, … status, what is the status of damage, and availability of … alternate, … rooms for …

I: Ok

P: Yeah. In some places, community structures were also used at that time. If they are using community structures, then they were, … less prioritised at that time

I: Right, ok

P: because many students were in the open, open ground

I: [Agreement]

P: Yeah, so, there were some criteria's. At that time and even now, for the transitional learning centres, there are very few er, organisations who are doing transitional learning centres actually, because initially lots of organisations were doing temporary learning centres

I: Right

P: But, after that, many organisations directly go to the permanent constructions

I: [Agreement]

P: and … they actually, … do not recognise the, … necessity of transitional learning centres, which we can't realise now, because we are doing, transitional learning centres, … from 2016, 16 yes. Before that, we had, … (?) temporary learning centres, more than 1000 numbers of TLCS were constructed at that time (?) And now…

I: Was that just [INGO] work?

P: Just [INGO] yeah, [INGO] with some (?) Like EU, USAID

I: Right

P: and, … in case of transitional learning centres, … we have done … 650 with EU, which is already completed, and now we are doing 250 transitional learning centres

I: Right

P: In 9 districts which are affected by earthquakes.

I: So the 650 transitional, or 650 …

P: Yes, these are also transitional learning centres, but we have improvised those 250, 250 TLCs, at first those learnings from those 650.

I: [Agreement]

P: We have some structural changes, structural changes

I: Right

P: and some foundation changes also

I: Right. So what, what is the benefit of using a transitional learning centre over a permanent structure?

P: yeah, actually, like our developing ... (?) we have less funds available at the time

I: [Agreement]

P: so we can not build lots of numbers with permanent constructions right now. So, those transitional learning centres are less cost, so, … for, … for one permanent constructions, if we need … 10000 dollars, then, it can be, … transitional learning centres can be built with that amount, with more than 10 or so

I: Right

P: Yeah, it will be effective to distribute in all those affected schools

I: [Agreement]

P: so, yeah, it is mainly for the cost-effectiveness, … and also, the structure itself, is earthquake resistant

I: Right

P: and we can see in the name of permanent constructions, some, … some, … or even organisation or schools, they have, they have built, … permanent constructions, but they are not actually earthquake resistant, even now

I: Right

P: So in that case, it is more safer, because all the materials are lightweight materials we have used in the temp, transitional learning centres

I: Right

P: and, another thing is, … Nepal has very difficult terrain actually, topography is very difficult, you can, I think you could realise it. (?) We need, sometimes we need 8 to 10 hours to reach from the road head

I: [Agreement]

P: in that case we can not …

I: by foot or by … (?)

P: By foot. By drive it doesn't matter, we can transport it, but for portering, it is, if it is more than 8 hours, we cannot, … bring those construction materials like, … metal posts, or cement, … construction materials, it's very difficult to bring in those areas

I: [Agreement]

P: So, so, to, due to lightweight of materials used in the TLCs, transitional learning centres, we are bringing actually, with some, with some more effort.

I: Right

P: Yeah, and they are, actually, we are sure that they will be using at least 10 years, those structures will be used at least 10 years. In some places not in all the, all the places, but, where there is very difficult transport materials

I: [Agreement]

P: they will be using at least 10 years, although we have, life span, we have, actually, … not life span, it is expected to be used, up to 3-5 years

I: right

P: but there are, very, some materials which are used in the wall, actually, due to those materials, it is expected only up to 3- 5 years

I: Right

P: Otherwise, if they can replace those infill materials

I: right

P: which are in the wall, it can be used, … more than 10 years. Even we can say that, some JICA structures which, … it is similar to, similar to that model.

I: [Agreement]

P: so it can be used up to 20 years if we replace the infill materials

I: right

P: so, in, especially in those remote places, … they have lots of challenges??

I: Right. And is that where most of the transitional ones that have been put in so far, have been?

P: Yeah, accordingly we have selected the site

I: Yeah

P: if the government can imitate and do reconstruction in those schools, then we are not going in those schools

I: right ok

P: because if government, and that's why we are coordinating with the government bodies – if you cannot construct in some places which are very difficult

I: [Agreement]

P: then we will do that in those places

I: [Agreement]

P: we can construct those transitional learning centres, we are coordinating that actually

I: [Agreement]

P: … do you like to see the structure

I: yeah that would be really helpful, if you could talk me through what materials and designs. (Long pause) *looking at digital drawings* cause this is one of the areas that I was wondering about

P: yeah

I: Because it buys you more time to construct a better school I guess

P: yes, actually, plans, plan never sets, so in, that we realise in that, in this earthquake, we had some planning in the initial stage, actually I was involved in, … many INGOs, I was, at that time I was with [NGO].

I: Right

P: Immediately after earthquake I was deployed in many remote districts

I: right

P: and … we, I was also involved in the development of those checklists, and some planning, like, we will do CFS in that period and that we will build TLCs, and then we will start permanent constructions

I: [Agreement]

P: we had some planning but it never worked. Due to many circumstances, yeah, due to the topography, many, … causes, the topography and the, … actually, economic condition of the country

I: right

P: depends on that as well.

I: *looking at digital drawings* I can never understand why you can't just rotate in both directions.

P: This is the plan, that picture. Yeah, actually, there are two classrooms in one TLC, …

I: Is this the temporary or the transitional?

P: This is the transitional that we are doing but…

I: Right

P: but, … it's similar to the, … temporary learning centres

I: Right

P: Because we have some guidelines in the size of classrooms,

I: right

P: so, for 25 to 30 students it is designed

I: …

P: and even in the CFS we were doing only, one room of that size.

I: right

P: so, the size are likely to be same. And, in many places what we, we have learnt or what we have faced challenges, that space actually, we cannot find sufficient space in our schools to construct…

I: right

P: the exact same size which is quite big in some remote and hilly regions

I: [Agreement]

P: it's difficult to find that place, … or space. But, … we are doing same typical design

I: [Agreement]

P: that is one of our limitations actually, … if we could do some, different types, like in the hilly region, we, we can size up to that size

I: right

P: we couldn't do actually, that type of design, typologies, although government have some typical designs for different topographies

I: [Agreement]

P: for the permanent construction. But, in case of TLCs there is no any type of designs, and before that earthquake, we, we were not really able to implement, or construct any kind of, I can remember that, in the initial stage, when, immediately after 4 days actually, I was in Nuwakot one of the districts, affected districts. I constructed one TLC which was, … in my own, actually, there was no any type of design I got from anywhere

I: …

P: after that, we developed actually, that plans and … the post sizes, these were, … when we construct one CFS, and a same moment TLC was also constructed with some bamboo structures. Bamboos were collected and then, … with some tarpaulins, we, … surround it

I: [Agreement]

P: and make one sample, or model

I: right

P: then, we, we build, it was, … some kind of evolution, … that it was developed, … after that, it was improvised with, with some, … kind of, … winterisation actually. We didn't, we didn't think at that time, winter will come. Lots of things were allowed? actually. And the interesting thing was, when we stopped thinking about the winterisation in those TLCs which was, … coming … within 2-3 months, yeah, after 2, 3 months, winterisation is coming, we felt that, we think in that way. But, … when we plan, and when we, design actually, winterisation materials, … what could be the material from the wall, or in the false ceiling, what could be done, we were planning, and … at the time of implementation, it was the mid of winter

I: right

P: yeah, delays actually

I: right

P: yeah, it happened, but, now, … we are in place that, … we can plan depending on, on our experience

I: [Agreement]

P: it happens, we can think up to the, … permanent construction stage actually

I: [Agreement]

P: yeah, so it was a big learning for us

I: yeah. So what sort of things did you do to winterise the structures initially?

P: Yeah, yeah, in the winterisation structures, actually, in the trial TLCs we don't have any kind of, (pause) like, … it was, … cold in the … winter and when in sunny days it was very hot

I: …

P: due to those tarpaulins which were surrounded. Then we, we provide this structure with some wooden planks in some cases, … and in some cases where there were availability of plywoods and transportation of plywood was easy, in that places we, we put plywoods from the inner faces

I: right

P: that said, that was in, then, the TLCs were somehow warm, and students felt, … easy to sit there. Otherwise it was very cold in winter

I: [Agreement]

P: and even in the summer it was very hot, in some places

I: …

P: yeah, we have, … some districts are connects with terai, lowland region,

I: right

P: these are very hot. In those cases, also the plywoods and false ceiling. At that time, I can remember that, we have done false ceiling with, … plywoods, and … also some of the, … clothes? were distributed at that time actually, for the students to stay

I: right

P: in, as a temporary solution, and for that, … special winter.

I: right

P: yeah. Now, it's been from 15, it's 3 years, many people, they, they forgot, and at that time, they were very conscious about, to construct even their own houses, they, they were thinking about the earthquake and, … they were using, … bands and other earthquake resistant features

I: [Agreement]

P: in their houses, but, now they, they are, … gradually, … gradually forgetting those events and then, … we can see that some structures are even without considering those seismic

I: right. Is that mostly in houses, or is that also in schools, have you seen that at all?

P: … not in schools

I: right

P: yeah, schools are, for schools government have clear, … clear policy on that

I: [Agreement]

P: which would consider those, … seismic features or seismic resistant buildings, … so, … schools they are, if they are constructed after the earthquake, they, they are, they are safe actually

I: right

P: but there are lots of structures which have been constructed before that, and they have no, there are no any kind of safety measures

I: [Agreement]

P: these structures are very, … from the front and … from the symmetry view its, kind of permanent structures also, … we have used metal post in the, in the corners,

I: right

P: in the corners. And CGI sheets are used in the roofing

I: right

P: and crosses (?) also used, and in the portion of wall, there is batten, bamboo batten – have you seen that, bamboo…we cut bamboo *Showing drawing* - this is the bamboo stem, this is the bamboo stem – it is cut in many parts and those strips are woven actually, in the walls, like, … in such a way, … smaller smaller strips are woven,

I: …

P: in the walls, this is the wall, these are the bamboo strips. Bamboo strips.

I: right

P: and there are, there are some metal straps in between the walls, and these are connected with those bamboo, bamboo strips are connected with the metal straps, and from the inner and outer side, there are, there is chicken wire mesh, wire mesh

I: right

P: and then, cement plaster is used

I: right

P: yeah, that's why we are, we are calling it's life span 3-5 years, otherwise, otherwise it will, will be more than 10 years

I: [Agreement]

P: or even 15 – 20 years. Only these things are, … degrading in, … 3 to 5 years. Other structures are not actually, any kind of temporary structures, they are permanent structures. only these things are the transitional thing. That's why we are calling transitional learning centres

I: Is there any other places where you can't even get cement to them, or have you always been able to use cement?

P: … yeah, always, because we have used contractors actually

I: right

P: and we have contracts with them, and any how, they are transporting it.

I: right

P: because we have categorised the sites according to the, … accessibility

I: [Agreement]

P: easy, medium and hard

I: right

P: if the site is hard to reach, the contractor gets, … more, … transport cost

I: Ok

P: that's why, there is no any problem of transportation actually

I: Right

P: For those structures. And these structures, on, another benefit from this structure, it, … use, it, … uses very less water

I: right

P: yeah. So, in many of our schools, there is no availability of water

I: …

P: even for drinking purpose, they collect it in a buckets and give the students, in that case we cannot, … cannot have lots of water to construct

I: right

P: but in those TLCs they, they use very less water. In, in, some of the, item of walks, in the RCC? works we use water, in plastering. Otherwise, it won't take much water. That is another benefit of them.

I: Right. So, just to clarify, you'd have, if this is the ground, you'd have, youd then have, a layer of, you'd have a post, which is a metal post?

P: a metal post yeah

I: and then, coming off that you'd have (Pause)

P: There will be truss

I: a truss as well?

P: A truss yes. I can show you a section. *Shows drawing* You can see that we have…

I: Right

P: three truss, … five trusses actually. 3 in the partition sections, 2 in the mid of room. Yeah, five trusses are put, all those things are put, we are using sections like, these are .37? 48, 48 square, square meter beams. And yeah, purlins are bit more, like 80. We have also the false ceiling, for those, for those changes in temperature, we have that provision also, which was not in the previous 650 structures. We realise that, … it was very hot in the, … summer, and in winter it was so cold, so the structure was improved, … putting some false ceiling, and the height was also raised actually. Before it was less than that, and now you can see that, it's like, 2.1, more than 2.1, yes, 2.4, 2.4m height, yeah. Yeah, actually the height was, in some places which were a bit mountainous, they, they prefer less height due to the coldness of the area if they have less height, it will be less colder

I: right

P: so they prefer less height. And in terai districts which is very low land, they need more height, height of wall. And based on both, those recommendations, average was taken actually

I: Right

P: and this is the structures, … these are walls which are made from the chicken wire mesh, bamboo batten and plaster

I: [Agreement]

P: and this is the floor, which is PCC (?), stone soling, with … some PCC walls

I: So the walls would be a layer of chicken wire in the middle, and then the bamboo…

P: actually no, in the mid there is, first there is, … there is bamboo strips like this, and then, from, inner and outer side, chicken wire mesh is placed. Chicken wire mesh

I: Oh so the chicken wire on both sides

P: On both sides. And they were connected with the GI wire mesh, GI wire, from the net. They were connected actually, inner and outer

I: Oh, so you tie them together

P: Yeah, like in retrofitting you can say that

I: [Agreement]

P: they are closely connected.

I: yeah

P: and then plaster work is done from both sides. And we cannot see in the finished structure, you cannot see the, those bamboo battens, even chicken wire meshes, we cannot see.

I: [Agreement]

P: for the finished structure, no one can say that it's a temporary or transitional, they say, they are actually, they, the schools and communities...when we start work, they, they are, … expecting … something that, that is temporary

I: [Agreement]

P: but when we complete, many, many schools demand more, and when we construct on, when they see the structure they are more happy than, than they expected in the beginning actually. Because from the initial, they , they have that mentality that we, if we say TLC then this will be kind of, very temporary, and some, … some low strength structures, they, they think in that way, but, when we complete the structures, they are more than happy, what they were in there. Yeah. I can show something.

I: Have you seen, kind of, cases where, by building a school within community in this way, have the houses then wanted to try and use this or ...?

P: …

I: is that something that you're encouraging or trying to avoid?

P: … now, actually, … we couldn't see because the metal posts are more, … kind of, … difficult to access, access, or difficult to get. So they haven't, I cannot see that type of structure that is replicated in the community

I: right

P: but, … I have some experiences when I was involved in retrofitting project before here

I: [Agreement]

P: there, when they see that kind of, … retrofitting, with very limited funds

I: [Agreement]

P: in, (?) place we went, actually, they, we can see lots of structure which were replicated after that project

I: right

P: we can see that

I: yeah

P: but this case … there are some, … that metal posts and other things, these are difficult to access by the community

I: [Agreement]

P: it is actually transported from the market, or, far market actually

I: [Agreement]

P: so, we cannot say right now those structures (?) in the community, yeah

I: Ok. How long would it take to construct a school like this?

P: Yeah, yeah, we actually, we have standard period of 45 days

I: right

P: in 45 days, … we can easily construct. But, in some cases, and … where … we had a rush, like …, monsoon was coming, (?) at that time, in those places, we have completed in 30 days

I: right

P: If we, if the contractor increases the numbers, to some extent, … it can be completed even within 25, in some cases 25 days, … is also possible

I: right

P: yeah. Because all the posts and metal things are fabricated in somewhere

I: …

P: they have ready

I: [Agreement]

P: ready those materials, and they just put it in the site, and the thing which takes time is the PCC or CV (?) logs. PCC walls, is so big, dried before we put, … other, … actually, we have carpeting and those things also in, in the structure. To put those carpets and … we need to dry the structure so, one, at least one week takes that

I: yeah

P: yeah, so ...

I: right. Does the bamboo require much treatment, or can it kind of be used as it is…?

P: No, no, there is … some requirement and some specification of that bamboo strips, these are too be well seasoned, and these have to be, the bamboos should not be used with the barks actually, … from the outer part should not be used

I: right

P: the middle portion of bamboo straps is only used. Otherwise, if we use, … green bamboo or, which are not seasoned well, then it, wouldn't last for 3, 5, years

I: [Agreement]

P: yeah, it can be decayed easily and…

I: right

P: so, we have all those things and specifications for every materials

I: [Agreement] yeah.

P: and I have some photographs you can, I'll show you….

(Pause) *Shows photographs*

I: Is there the worry that because they look permanent, communities are more likely to just use this beyond it's life, or are they still wanting to construct a permanent school?

P: yeah, actually, … if they, they are getting other RCC structures, or, or mainly, … in … in our case, the schools prefer RCC structures for permanent structure, not with the CGI sheets

I: yeah

P: even if it is permanent structure with CGI sheets, CGI sheets, they … do not much prefer it, they prefer RCC structure with slab

I: right

P: so, … if they get, … it is … informed from the beginning, we, we always have orientation type of things, and briefings about the structure themselves, and we say that it is that type of structure, and it's lifespan is that much, so if you, … you are not getting the permanent structures within this period, then you, you can also replace, … the infill walls

I: [Agreement]

P: with some, … bricks or stones

I: [Agreement]

P: yeah, then you can use it up to 15, 10 to 15 years. But, I don't think they will do to that, … type of structure, they are thinking for permanent use.

I: right

P: yeah

(Pause) *searching for pictures*

P: Yeah, this is the structure, it is….

I: right

P: that beginning structure actually. Yeah, this is the structure, and you can see that, we have, … some transparencies for the purpose of light

I: [Agreement]

P: and we have specification also for that, … we should put it in the north, north east, so that it will, the sunlight will last longer

I: …

P: yeah. And no one can say that it is, the, … made from bamboo when it is completes, yeah

I: [Agreement]

P: and, yeah. You can see that there is a gutter for water, rain water, we have that.

I: is this just paintwork, these lines?

P: no, these, these are the metal parts

I: the metal parts

P: yeah, so these are the parts, and even in the mid there are some straps of metal which are, … less thicker

I: right

P: to withstand the bamboos

I: right

P: but these are covered with the plaster

I: [Agreement]

P: main posts and those things are, … exposed, with, with paints, yeah

I: right.

P: and the structure is very light actually, the thickness is only, … it's 75mm, 7.5cm wall thickness. So the structures are very safe

I: …

P: and we have that provision that we, … if, … they are not … using those TLCs for students

I: [Agreement]

P: if they are planning to, use it by office purpose or other things, … we, we are not constructing it. It is agreed in the beginning that they will be used for … prioritising the lesser grade students

I: right

P: because they, they cannot move anywhere, because, even in some cases if we construct 2 rooms, there are other structure, other permanent constructions which, which are … in red sticker or yellow, they are staying in that. Some students with the upper grade

I: right

P: are still studying in that, and the main, main purpose to … be used by the lesser grade is they cannot escape easily

I: right ok

P: so, they, … if we put higher grade in those available structures, it is, (Pause) they, they can easily move out

I: [Agreement]

P: so that is only the, …

I: so would you, at each school only build one of these buildings, or would you have the facility to put in several if they were needed?

P: Yes, several. Actually, if they need four rooms, or, if, in some cases we have constructed 5 TLCs in one school

I: right

P: so, if they, depending on their needs

I: [Agreement]

P: creating the numbers. And, … in, … with those structures, we have also toilets, and handwashing points, this is also in the package. These are also constructed, and, we have, yeah. And some, there are some basic … features for disabled children's,

I: [Agreement]

P: ramps, and the door of the classroom, they are, quite larger, to enter by the wheelchair. Although, all the disabilities we cannot address, some of the physical disabilities we can address with those structures, you know

I: yes

P: and these are also, we are seeing that these are eco-friendly, like, there is, you can see that there is, … open mud in that part where, it is proposed that they will be, the school will be, … growing some flowers, or some…

I: right

P: for these parts, these ones here

I: right, ok

P: so, environment friendly, that's us

I: yeah, they don't use very much construction material and things like that

P: yeah. And you can see that there are two structures which are done by (?). We cannot combine those two structures, if they need four classrooms, we cannot, … same structures with four rooms, due to the, due to the earthquake, … safety actually

I: yeah, it can't be too long

P: too long, yeah, there is some criteria for that. At least three times width, up to three times width we can go, but more than three times of width we cannot go that much length. Yeah, this is the criteria

I: and so most the blocks would follow that one design?

P: yeah

I: and there might just made smaller if the sites not big enough?

P: … yes, … size is same for all

I: [Agreement]

P: Because … we were also thinking, on the, on some modifications, in the mid, mid of the project, because we, we are, … now completing in this project, by this December, …

I: right

P: we will be completed 250 TLCs, but some, suggestions, some suggestions from the government, actually, they have given us, but, … it's very difficult to incorporate those things, because, … we have contact with the contractors and they have already fabricated all those metal, metals. And we cannot now increase the heights and other things, because it is already fixed, and it implicates the cost

I: yeah. What are the sites that the schools are normally built on like? Is it normally good for purpose, was it poor quality, are there other hazards that affect?

P: Sites?

I: yeah

P: site location, or, … in the process of site selection, we have a detailed checklist actually, we have developed, … where we, we should construct, or where we cannot construct the structures

I: right

P: we have that. But there is always challenge for the sites, … allocated by the community. They always allocate the land for, which are not used, and which are, … in, … which are in the side of river, or in vulnerable zones, like landslide zones

I: [Agreement]

P: we have got, some, even when we are taking care of all those things, we are still getting some issues of landslides, which are affected by, affected in that monsoon

I: right

P: so …

I: is there any work that you do, or you can join with to improve that, or to put in retaining walls, or is that…?

P: yeah, we are, if we, we have that space and we cannot move, … anywhere from that space

I: …

P: and the school needs it, the school needs the room, in that case we have made it special case, and we assess the site, and, … there, we have, … constructed some retaining structures

I: right

P: … and, we are doing that actually

I: right

P: but, for the special cases, we, principally we avoid those sites, but, … in some cases we cannot go beyond, go, … far off it, and, we constructed retaining structures, or some kind of toe walls

I: right

P: and then, … only we construct the schools. But in many cases, … the terrains like Nepal, is very, all the schools are in slope areas actually

I: [Agreement]

P: and that needs lots of attention, even from geological point of view. Not only civil engineers or structural engineers, can oversite it, yeah, in some cases, … we should see the type of soil. If the type is very loose, it is avoided actually

I: [Agreement] right

P: in one case, one TLC, we have demolished

I: right

P: we have already construct one TLC. Due to poor condition of site, … it was so vulnerable and we could not improve or maintain that TLC, even with some structures, then, in that case we have demolished

I: right

P: yeah, for the safety of the children

I: right

P: but it was very difficult because, the community, they oppose, they were saying that ‘we will maintain it, and use it, why are you demolishing, why are you bringing those materials that are already in our place?’

I: [Agreement]

P: yeah, it was … very difficult to convince them, but, … with a long meeting with the, … SMC, head teacher, they realised at last, you should not compromise the life safety of the children, so they, it was demolished

I: right

P: we have lots of those type of experience. Even from the, those 650 TLCs we are still doing some protection works, because we are liable for those structures, up to when they use it, so we are, … getting some internal funds

I: right

P: to do that safety protection works

I: right. Are you able, from the work that you do, because you obviously have quite a big coverage in lots of the areas, to then link to the government, to recommend more long term planning of when those schools should then receive permanent construction?

P: … yeah. Because we are coordinating with the, there are some authorities which were, which were, … made after, for this reconstruction, there are authorities like, we call it Central Level Project Implementation Unit

I: [Agreement]

P: it is in the, in Kathmandu. And their branch is like District Level Project Implementation Unit, we call it DLPIU. They are, DLPIUs are in each district

I: [Agreement]

P: and we actually coordinate in both levels

I: right

P: from central level we, we coordinate with them in the planning process, in the selection of districts, where should we go, and where are, where they are allocating lesser constructions, in that way, we deal with CLPIU. And in case of DLPIU, our district engineers are there

I: right

P: one engineer in each district are there. They coordinate with DLPIU, … to, to select the sites, actually, yeah

I: right

P: to select the sites, which are, with our criteria, donor requirements, and the feasibility actually, they assess the site, … with their technical, er, assessments

I: [Agreement]

P: and only we finalise it. And copying with CLPIU, we, we, there is a rigorous process in the selection actually, we have some criteria's, you, I can show you that criteria, yeah.

(Pause) *showing document*

P: type of selection criteria, like when, we have already discussed that

I: [Agreement]

P: high level of damage, we should see that length (?), there should be high level of damage with few, if any, safe classrooms. High number of red-flagged classrooms. Red will get prioritised and no other permanent constructions being undertaken, so …

I: [Agreement], which I guess the CLPIU will have to advise you on, because they are overseeing everything

P: yes. We coordinate them,

I: right

P: to get where they are not constructing permanent construction.

I: [Agreement]

P: and they always select … the accessible sites for their construction, and we are always in the hard to reach sites

I: right

P: so that, the project is very challenging now, because of the accessibility

I: …

P: we, we are not, … the contractors they are, … they are somehow delayed actually, yeah, due to those things, accessibility is the main reason, and some other administrative parts, yeah. And, also, we do have, … that risk, school does not have any risk of flooding, landslides, liquefaction. So we follow those criterias in the selection process, and we always coordinate with the government bodies, yeah

I: right, ok

P: yeah. do you have any…

I: you mentioned accessibility as a big challenge, are there any other challenges particularly that you face?

P: yes, another was that type design actually, we should have, … lots of types according to the, according to the location

I: …

P: we don't have, that is another, … what you say, it's a technical, … not actually technical, because we don't have any, … different types of, … structures. That is another one. And … yeah, in some schools, very few actually, they are saying that 'These are TLCs so we need permanent structures'

I: right

P: and although they are staying in the bamboo structures which were initially constructed … that time. But even with that, if we get that structure, transitional learning centres, will not be getting more permanent constructions

I: right

P: that is … the person from, some of the schools, very some

I: right

P: but we are getting that. … Yeah, in … one technical, actually technical, … learning, … we have is in case of land (?) things, we have used different colour, erm sheets, (?) sheets, these are in case of other colours, cream colours, we are raising in some districts, there is no problem of that, reflection of light, but in the red colour, with, … in some districts they, they are actually complaining that it's reflects too much, and it's very difficult to stay longer in the building.

I: right

P: so, if we, that is another lesson learnt for us, we will not be using red colour

I: right

P: yeah. But although we have, … we have corrected, or, we have some solution for that, … but yeah, initially, we, if we have, when, if we knew that, then it could, we can just change the colour

I: yeah

P: that was, yeah. And some, some of the, … managerial problems, so we, we, we can't get in the process of construction, there is always challenge to, to handle the contractors, because they are not so much professional in our case. They say one thing and they do another thing

I: right

P: usually. And some quality issues always come, they, they want to make more profit and

I: …

P: that will decrease the quality, so, it's very difficult to, …, or, we have engineers in each district, but they cannot oversee all the time

I: yeah

P: in the structures. … so sometimes, … some quality issues we are getting. But at same time, we have third party consultant to see, or to observe the quality

I: right

P: so that they, they actually certify our structure

I: right

P: they are in place, so, it's, it's actually balancing

I: right. Is that specific to your work, that you've arranged, or is that generally across all school construction?

P: … no, our, … not in the other projects, they don't have any third party, but, what is learned, or what is being exercised is, … they, they take some, evaluator or at the last, or in the mid, … and there are some district level technical persons, Department of, District Education Office, and there is District, … District Technical Office, DTO yeah. They monitor jointly, … the structures, they, they have some monitoring mechanisms, yeah

I: yeah

P: that …

I: right. I think my final question would be, you have given me loads of really good information, which I have to now process, but, looking forward to, so western Nepal, where they haven't been affected by the earthquake, but their schools are still really vulnerable

P: yeah

I: are the transitional learning centres something that you think would work well there, or would it not be, … so if a school was vulnerable and needed to be replaced?

P: … yes, I think yes, Transitional Learning Centres will work in that situation also, because, these sites are also vulnerable in the future, because we haven't got, there is some, … if you get, you see historical timeline, … the earthquake may happen in even, … it's more than 200 years

I: …

P: so there may be, there may be, some big huge earthquake in the future

I: …

P: so, … and at the same time, the structures are very vulnerable. Although the structures in Kathmandu and (?) were somehow good, these were destroyed totally destroyed.

I: yeah

P: if we, in the same way we can imagine that, if, in similar kind of earthquake happens in that area, there won't be any structure

I: …

P: which is safe to use after that. So that's why I think, if we can build, … even in the cluster, or one in the one cluster, it can be used, … after earthquake, because the structures will be totally damaged at that time

I: [Agreement]

P: they are very vulnerable and most of the structures are made from mud in the join, in the join. Cements are very less used

I: …

P: and only the mud is used, which is, which don't have any shear strength actually

I: yeah

P: and can be destroyed with little effort

I: yeah

P: so, transitional learning centres, if we can build, prioritising some areas which are much vulnerable

I: yeah

P: it could work, it will be beneficial for them and for the mason also.

I: ... Is it something that if, or when another earthquake were to hit Nepal, you would straight away go to trying to build transitional learning centres, or would there still be a need to put in temporary solutions first?

P: … first, we should go for temporary learning centres, because we cannot build, and we should continue the education with the temporary learning centres.

I: …

P: so, … if we have capacity to construct transitional learning centres, we don't refer immediately after, because, … it's principally, we should not, … discontinue the education of children

I: yeah

P: if we can construct in temporary learning centres, we can build within one or two days, so they can continue in those TLCs. At the same time, we can plan for transitional learning centres

I: right

P: yeah

I: ok. Brilliant, I think I am overwhelmed by information. Have you got any questions for me, or anything else you think is particularly relevant?

P: Not as such, but, …

I: No.

P: How will you, what is your main theme, is it only the reconstruction process in Nepal, rural Nepal, or are you going to, … have some quantitative analysis for that?

I: So, it's mostly done qualitatively, qualitatively

P: qualitatively

I: I still can't say the word. Because, because of what is achievable within my research, there are so many schools and they are so wide spread, getting to be able to view enough schools to get quantitative data is really challenging

P: yeah

I: and so, I'm just trying to follow as many individual schools as I can, and get first-hand accounts of what is happening, and from that, and from the interviews and meetings that I've had so far, I've picked up small bits of individual good practice

P: yeah

I: that, with all of those, I want to collate into sets of guidelines, or decision making tools

P: yeah

I: that could be used by NGOs or …, if possible to implement with the CLPIU and people like that as well

P: yeah

I: … one of the things I really want to be able to produce …, and it might be that its very basic level, but its mapping where different technologies are most suitable,

P: [Agreement]

I: and how different areas work better with different materials and where does it make most sense to use RCC and fired bricks. I've also seen some CSEB projects, … and where that would work really effectively, and where actually, it's not going to have as much benefit, and where it's only to use stone, and when you're constructing in stone, what guidelines do you need to follow. And tying all of that information together hopefully. And then tying in with things like this, where using transitional learning centres, one of the problems that I've seen that has come up a lot, because resources are in such demand, they are in such a short supply, that it then becomes very hard to construct, and it makes permanent construction very expensive. So actually, by buying yourself 10 years, you can then in some areas where it would be very expensive to construct, if you delay your construction by 5 years, it will then be more cost effective to build a new school

P: yes

I: so yeah, trying to tie all of that together into some guidelines going forwards, both for the earthquake affected districts, although by the time I'm finished, I have another 2 years, … a lot of the reconstruction work, there will still be lots to do, but a lot will have finished, or will have already be, kind of, underway

P: yeah

I: so I particularly want to look at how the lessons learnt from the earthquake can then be applied in Western Nepal and the areas that weren't affected

P: Yeah, actually, some recommendations for Western Nepal would be good, based on this research. And there is always, … different practice or different methodology, … depending on the location actually. You have, you are doing in Nepal, but if you change the country, then, the principal may be changed

I: yes

P: for, for some countries, … but we can generalise with some, … conditions or criterias in such type of countries, it would be good.

I: yeah, because the material challenges might be different

P: yes

I: but the overall strategy approaches … I met with one organisation who, … some organisations I've met with, because of how they're funded, their work is really distributed across the districts, because it comes from individual donations and things

P: yeah

I: whereas

P: yeah, sometimes donor they, they picked out some districts, or they select the districts and go for that districts.

I: whereas, I met with, one organisation I was speaking to, they were saying they work solely in two districts, so they can have a much bigger presence, and they can streamline their work

P: …

I: and they now have a warehouse in that area, so they have more control over their supply chain and things like that

P: [Agreement]

I: and that sort of approach is then transferable to other countries

P: yeah

I: even if the materials are slightly different, so

P: yes. And you will be coming next time also,

I: yes, hopefully I, there's a conference I want to come to in April/May time, so hopefully I will visit a few more schools as well. Yeah, there's still lots to do.

End of recording and interview

Appendix H:

Catalogue of challenges, contexts, and good practice

Appendix H. Catalogue of challenges, contexts, and good practice

Labour:

Table H-1 – Catalogue of good practice and contexts for challenges relating to labour, along with frequency of reporting, of both the item of good practice and the associated challenge.

Sub challenge	Good practice	Context/ relevance	Good practice reports			Challenge reports		
			High-level	Case-specific	Total	High-level	Case-specific	Total
Cutting stones is labour intensive and slow	Utilising technology e.g. stone cutting machines, to reduce labour time required	Remote areas (where stone is commonly used) - could be two day walk from closest seasonal dirt road	1	0	1	1	0	1
Demolition of damaged building is time consuming, because of lack of man power - delays start of construction	None reported		0	0	0	0	1	1
Lack of experience in running construction projects	Contractors overseeing hiring of labour - can stipulate where labour should be sourced within contractor agreements	Organisation initiating and running projects had limited/no construction experience, so outsourced to contractors. Contractor agreement stated that most labour should be sourced locally	0	1	1	0	1	1
No direct links between housing and school reconstruction. Some skilled labour wasn't available locally	Using/ hiring professional labourers	Professional contractors (skilled labour) mostly available in accessible areas (though can be available in some rural areas). For one project, contractor agreement stated that most labour would be sourced locally, but this wasn't always possible for skilled labour). For one, labour was a mix of external hired workforce and some contracted locally	1	3	4	1	3	4
No direct links between housing and school reconstruction	Working with labourers who have received training on previous projects	There are indirect links between housing and school reconstruction e.g. mason training for housing reconstruction	1	1	2	1	1	2

Lack of capacity of skills, with labourers not as skilled in new types of construction, and even when training provided, skill is still low	Provide on the job training	Major challenge at some sites, minor at others. One organisation stipulated that most labour should be sourced from the local area. Case study: Training for labourers and community members – NGO provided technical training for 90 masons in the village, and technical support for families during reconstruction (450 (70% of eligible) households had been rebuilt in the community	1	3	4	2	4	6
Masons and labour may leave projects due to delays and breaks in construction (particularly if paid daily, in order that they can still receive a wage) - particularly a challenge if training has been provided, as new labour then needs to be sourced, and more training provided. It is particularly difficult if working with schools across a wide area, as it is hard to engage with local masons and retain them between projects	Long term engagement with local masons, moving them from project to project during delays after for new projects starting	Major challenge at some sites, minor at others. One organisation limited focus to only two districts, while the other had very widely distributed projects. If projects are spread over a wide area, it is hard to engage with local masons and once they are free, they will move on to other projects	2	0	2	2	0	2
Huge scarcity of masons and labour due to the volume of construction work (and despite the high unemployment rate) - there are now labourers migrating from unaffected districts in Western Nepal, in order to receive the higher daily wage (1000NPR vs 500NPR)	Providing training to increase amount of labourers available	Major challenge at some sites, minor at others - one district this was faced in was Nuwakot	2	0	2	2	0	2
Supply/demand gap due to amount of housing reconstruction required - shortage of labourers - if locals will pay more for labourers for housing reconstruction, can be hard to get labourers to work on schools at a lower wage	Engage with community and school staff (i.e. through social mobilisers) to find labourers (e.g. local masons, volunteers) (with training), and understand time commitments such as social events that may interrupt - better research before starting can reduce delays	Case study 2: Construction took approx 2.5 years but only 7-8 months of effective construction, due to interruptions and lack of man power, because of reconstruction of houses, and issues of accessibility (poor condition of roads, logistical problems, road blockages, elections)	0	2	2	0	2	2
Difficulty translating designs for the field level, into replicating that within construction (due to quality of materials, workmanship and level of knowledge of the engineers)	Making sure designs are understandable and replicable at field level (suitably translated)		1	0	1	1	0	1

Still little regulation on professions for earthquake resistant technology - no license to work is required, and no official training (done on visual inspection, own experience, even if illiterate - hard to guarantee quality of workmanship). While there are engineers available in each district, they are limited, and not able to oversee things all the time, due to the lack of capacity (due to the amount of construction taking place) - scale was already beyond capacity from before earthquake	Multi-level monitoring, with regular supervision from engineers, and checks from supervisors and district and central level personnel	Transitional learning centres (third party supervision is specific to this organisation, although other monitoring mechanisms in place across other school construction)	2	0	2	2	0	2

Materials:

Table H-2 – Catalogue of good practice and contexts for challenges relating to materials, along with frequency of reporting, of both the item of good practice and the associated challenge.

Sub challenge	Good practice	Context/ relevance	Good practice reports			Challenge reports		
			High-level	Case-specific	Total	High-level	Case-specific	Total
Material suitability affected by a variety of factors - seismic resistance, shortages/supply, quality, cost, location, environmental impact	Select technologies considering technical, social, environmental and cultural dimensions, taking into account outside factors such as cost and quality of materials available, political blockades, fuel shortages that affect availability and transportation	construction across all of Nepal: the factors vary with location (i.e. topography, accessibility), time (i.e. fuel crisis/blockade, demand) etc.	2	0	2	3	1	4
Fired brick is prone to breaking on long journeys and inaccessible sites, which can increase costs (and need vehicle transport)	fired brick (steel and RCC bands) - Terai region (and areas accessible by road/river) (Southern Nepal)	Most likely in more remote areas, areas a long way from brick factories, particularly poor quality roads (and has terrible environmental performance). Most suitable in Terai region, urban areas, plains, low hills, or along rivers and higher hills where roads are good quality	1	0	1	1	0	1
CSEB is new technology so there is unfamiliarity with it. Also all construction material quality is deteriorating, which price is increasing (supply less than demand)	CSEB reasonable (steel and RCC bands) - Hill areas (and areas accessible by road/river) (Middle Nepal) (reduces amount of material that needs transporting)	CSEB is a good material and has lots of benefits (quicker, easier, less labour), but will be new to many areas. Hill areas (and areas accessible by road/river) (Middle Nepal) (reduces amount of material that needs transporting) - dependent on soil composition/quality. Suitable for new and reconstruction projects	1	0	1	1	0	1
Many sites not suitable for CSEB - not the right composition of soil - becomes expensive if you have to transport sand or gravel a long way up hill - mostly in river bed areas, not hills	Test soil composition before design/construction (to check feasibility and to balance ratios) - either avoid, or calculate any additional sand/gravel that would need to be added	Research of soil samples of 10 schools showed that none were economically viable, and only 1 would be viable by adding 8% cement (natural stone would be cheaper) - affects cost-effectiveness	1	0	1	1	0	1
Limited testing available for CSEB	On site tests: Can use Jar test to work out ratios (to +/- 10%) - (want 55% sand and gravel, and 10% cement) - not greatly accurate but easy to train in, and replicate on site. Also wash test	CSEB is equally or more safe than fired brick in hilly areas, and is good environmentally, but can be difficult to test	1	0	1	1	0	1

	Other tests under development (Compression tester at head office (but requires bringing bricks to KTM), drop test)	CSEB is equally or more safe than fired brick in hilly areas, and is good environmentally, but can be difficult to test	1	0	1	1	0	1
	Selling compression testers to entrepreneurs for cheaper than cost ($200 rather than $300), to encourage them to buy and use)	CSEB is equally or more safe than fired brick in hilly areas, and is good environmentally, but can be difficult to test	1	0	1	1	0	1
CSEB is a new technology so masons/labourers unfamiliar	Create/establish and work with a network of entrepreneurs using CSEB, building up/equipping and utilising skills and knowledge in an area	CSEB is a good material and has lots of benefits (quicker, easier, less labour), but will be new to many areas	1	0	1	1	0	1
CSEB is a new technology so masons/labourers unfamiliar. entrepreneurs independently importing CSEB machines, or using/selling machines with little or no training (corrupts the market and affects quality)	If initially introducing CSEB into an area, needing training and set up time - allow for extra construction time	CSEB production. CSEB is a good material and has lots of benefits (quicker, easier, less labour), but will be new to many areas	1	0	1	1	0	1
No construction guidelines for CSEB (like there are for fired bricks, i.e. rules of thumb) - have to follow exact design	Broaden approvals to include any suitable brick type i.e. CSEB within an RC load bearing frame	Approved CSEB designs, but no guidelines/rules of thumb (they are available for fired brick) - with this there is more flexibility to build any type of house/school, staying within those limits. (one example of RC frame and wanting to swap fired brick to CSEB when fired brick became unfeasible - would have reduced cost by 30%, but government said no)	1	0	1	1	0	1
No material is perfect for all of Nepal: very varied topography makes different materials not suitable for different areas	Stone, with cement mortar and steel (and steel and RCC bands) - High hills and mountains (Upper middle), or on poorly paved roads	High hills and mountain areas, poor quality roads	1	1	2	1	1	2
No material is perfect for all of Nepal: very varied topography makes different materials not suitable for different areas	Stone, local materials (mud mortar often is used - should be avoided) (hopefully timber bands) - Mountains (Northern Nepal)	Mountain areas, no road access	1	0	1	1	0	1

Cutting/dressing stones to regular shapes is labour intensive and slow - often not done perfectly, only using a hammer, and can mean random rubble is used instead, which is not a good construction material. Stone can be used with RC bands and lintels but through stones etc. should still be used	Stones should be dressed - regular/semi-regular shapes, to improve quality of construction (and using corner and through stones, along with other seismic elements e.g. through stones, lintel bands, sill bands, bands at openings) - stone cutting machines can be brought into communities to help speed up cutting and reduce labour intensity	Stone commonly used in remote areas (one school project planned with stone by this organisation, a two day walk from closest seasonal dirt road) (Mason training and relatively well known material, but the bottleneck is in cutting the stone)	2	1	3	2	1	3
High quality materials were more expensive - two to three times more expensive than normal (including effect of the blockade)	Account for higher costs, to buy higher quality materials		0	1	1	0	1	1
Couldn’t get a proper bill of materials	Get quotations for buying materials (and use these!)	Within Kathmandu Valley, so materials were easy to get, got quotations and used that (only the challenge reported in case study outside of Kathmandu)	0	1	1	0	2	2
Bricks, cement, wood and steel brought from KTM to local markets and then purchased locally from there	Some materials must be purchased from Kathmandu if not available locally i.e. bricks, cement, steel, timber (though may then be more difficult to transport)	A school ~6hr drive from KTM. Cement was available locally for HD, but difficult to transport materials during rainy season	0	2	2	0	2	2
Materials supplied through competitive bidding process and contracts - complex and suppliers working for several schools and with different vendors	Hire a warehouse for local headquarters, to take control of supply chain, rather than relying on external suppliers		1	0	1	1	0	1
Difficult to deliver materials during monsoon, and on poor roads - can lead to bricks breaking and sand spilling, increasing project costs	Account for high transportation and material costs, and delays when planning	varies by location, even within a district ('people can be trained, but if it's difficult to take the materials and transportation, then it's a big challenge'	1	0	1	2	0	2
Expensive to transport materials all the way from Kathmandu. Fuel blockade and shortages made price 5-6 times higher, so transporting materials far more expensive, and very hard to transport to villages.	Purchase materials from local/closer markets rather than direct from KTM (e.g. steel, sand, cement) - reduce transportation to be overseen	Fuel blockade wouldn't have been an issue in a normal political environment, but even in normal circumstances can be expensive to transport materials a long way. Case study used a 'local market' for purchasing - still 4hr from school, but KTM would have been 8hr.	0	2	2	0	2	2

Material cost is high, (and exacerbated during blockade/closed border with india - made materials much more expensive (3x as much as normal). Using local materials can lead to issues like deforestation, or excessive removal of material from rivers ('encroaching' on the environment), and policies can reduce the amount available, so have to go further to get material	Using local materials can reduce costs (free, and lower transportation) e.g. stone and timber. A quick feasibility study before construction can help to identify suitable material, and materials should be sourced responsibly (timber in line with any tree planting/protection schemes etc., and stones and sand not just extracted from river beds without permission)	Sand and cement available from local markets, steel from Chitwan). Can be suitable for schools located in the forest/jungle, and deforestation particularly was common along road sides (particularly in the past, but the trend has reversed due to the policies/control put in place)	1	2	3	2	2	4
Individuals can struggle to buy enough materials from markets, as they are seen as less reliable so markets are less keen to trade with them	Schools, institutions, government schools are seen as more reliable customers as they are able to pay more and have more support so is easier to buy enough materials for construction (which can be difficult for individuals)	School was able to pay more money so didn't have an issue buying enough material. Markets won't trust individuals as much as institutions and government schools, because it is easier to make sure they get their money	0	1	1	0	1	1
	Make use of existing pipelines/ groundwater supply to the school site (water availability included in site selection criteria)	There was an existing pipeline to the school, that could be used for the construction, so this didn't require any additional work. Another had an existing ground water supply that could be used	0	2	2	0	2	2
No water supply available at the school	If no water supply to the school - include pipeline within construction project, to ensure water for construction, and to then be used after for improved WASH facilities	Previously no running water or good toilet facilities	0	2	2	0	2	2
Lots of water required for permanent reconstruction, which is limited/not available at many schools	Transitional learning centres use less water within construction, so could reduce demand until water supply can be built in later years	Transitional learning centre design	1	0	1	1	0	1
Material storage (Cement not stored properly). Lack of space available, which means materials can be damaged or not stored safely, and take up space that would otherwise have been used for other purposes	**Not reported within an interview: Identify suitable storage areas for materials - materials should be stored safely so not to get damaged*	Limited space available at site for proper storage (and storage/protection en route). At one school the material was stored outside, which took up space that the students used to be able to use as play space (for approx 3 years)	0	0	0	2	1	3

Preliminary TLC designs did not have sufficient winterisation and weather proofing (too hot in summer, too cold in winter), and when these were adapted, it was already winter. For permanent construction: There were issues with integrity of infill walls connecting to the main columns and load bearing elements in construction before the earthquake	Review process from construction activity and designs before the earthquake, and during reconstruction phase to update and enhance designs to overcome these issues (i.e. walls not tying to columns)	Temporary learning centres	2	0	2	2	0	2
Previous construction used mud mortar for schools (either whole or infill with steel frame) - these performed poorly	DUDBC/CLPIU approvals process introduced to control what materials are used within designs (no mud mortar allowed), and review designs (any comments made should be incorporated into design before construction begins)	Mostly rural areas, infill walls not tied properly - frame and roof survived but walls failed	1	0	1	1	0	1
Earth bags don't provide sufficient resistance to overturning for a school and steel to counter this is not compatible with this construction	No earth bag or mud mortar construction permitted by government for school reconstruction	Earth bags don't provide sufficient resistance to overturning for schools. Can't add in steel which would counter this, as it wouldn't be compatible with the earth construction (rust, degradation, lack of cover)	1	0	1	1	0	1
Seismic resistant design	Designs should be completed by an engineer with professional experience (registered with Nepal Engineering Council), to be compliant with NNBC, and including seismic detailing (deep foundations, through stones, strong frame, ring beams and lintels)	Case study 1: regular design, using stone (and through stones) and RC beams/lintels	1	3	4	1	3	4
	Having a range of type designs (and site specific designs) that are compliant with NNBC can help speed up approvals process, and ensure quality of design - have a mix to cater for different sites and requirements e.g. 2, 3 and 4 room blocks, different materials)	Case study 1: regular design, using stone (and through stones) and RC beams/lintels	2	0	2	2	0	2
Previous construction was just 'piles of bricks' - poor seismic design	Use steel RC beams throughout building (at every step, every 3ft - lintels, sills, openings)	A school ~6hr drive from KTM	0	1	1	0	1	1
Concrete/cement ring beams are expensive to make	Use cement within ring beams but not for anything else	Cement expensive and is hard to transport to remote areas, but all locations and materials could utilise ring beams	1	0	1	1	0	1

Concrete/cement ring beams are expensive to make	Use timber to make ring beams, rather than cement	Cement expensive and is hard to transport to remote areas, but all locations and materials could utilise ring beams	1	0	1	1	0	1
While earthquake resistant technology is increasing, there is still little perfection with it, and little regulation over professions to guarantee it. Quality can be affected by contractors cutting corner to save costs and achieve higher profits - what is built may not be what is designed	Multiple levels of supervision and checks from qualified personnel (project engineers, district and municipality engineers, and NRA), to ensure quality	Frequent visits from implementation NGO engineer, and several visits from district DLPIU engineer too, and municipality engineer and mayor visited, to do checks on quality. One engineer may be supervising up to five schools. Also applies to transitional learning centres	2	2	4	3	2	5
Organisation had limited structural/construction experience	Engineer outline design to project managers, outlining important seismic features etc. to improve understanding and aid project management (ensuring seismic details are retained)		0	1	1	0	1	1
Building with earthquake resistance is a lot more expensive (approx 50% saving without them e.g. only using 1 rebar in each corner of a room, rather than 10 per room)	Work with community and school to raise awareness of importance of seismic resistance	Particularly an issue with less regulated construction through private donors, internal funders etc. that don't go through government approval process	1	0	1	1	0	1
Original reconstruction design had no/limited storage provision	Work with school to understand requirements and ensure design is fit for purpose	Rectangular two storey block, two classrooms per floor	0	1	1	0	1	1
TempLC design not suitable for actual life span they are used for, and construction time for permanent construction can be too long. Transitional learning centre design requires walls to be left for a week before carpets can be put in	Transitional learning centres provide a semi-permanent learning space (3-5 years), in a shorter construction time, so are quicker and cheaper to deliver (constructed using metal posts, CGI sheets, metal trusses in roof, bamboo batten walls with metal straps, chicken wire and cement plaster, concrete/stone soling floor, gutters)	Temporary/transitional learning facilities	1	0	1	1	0	1
Degradation of walling materials of transitional learning centre limits life span to 3-5 years (but in some places will be used for 10+ years)	Can replace/upgrade wall material to extend life from 5 to 10-20 years	Transitional learning centres will be used for at least 10 years in some places where it is very difficult to transport materials. The expected life span is 3-5 years, due to wall materials, but by replacing/maintaining these infill materials, life span can be increased to more than 10 years, up to 20 years.	1	0	1	1	0	1

Meeting needs/capacity of the school. There is only one type design available - makes it less suitable for some areas	Transitional learning centre design - several standard building designs so easily replicable and easy to produce pre-fabricated elements (should include toilet and handwashing stations and accessible features e.g. ramps, wide doors)	Transitional learning centres. Can build several buildings (all the same size) at one school, to meet the requirements of the number of children/classes. (must be separate buildings though, to be in line with building code – maximum of 3 times as long as the building is wide). Also have toilets and handwashing points included in the package, and there are features for disabled children too, such as ramps, and wider doors to accommodate wheelchairs	1	0	1	1	0	1
Preliminary TLC designs did not have sufficient winterisation and weather proofing (too hot in summer, too cold in winter), and when these were adapted, it was already winter. Also issues with temperature control with early transitional learning centre designs (and variation between mountain and terai regions - mountains want short buildings as it is cold, terai want tall as it is warmer). Some colours of CGI sheets are also less suitable (red, because it reflects too much, makes it difficult to stay in the building a long time. But it is expensive to change design midway through the projects, as they are pre-fabricated, so hard to adjust	Updated design after first phase, including better walling material (planks/plywood), false ceilings (increased from 2.1m to 2.4m (cloth in terai regions), cream/transparent CGI sheets (not red)	Transitional learning centre design - government suggested changes/improvements but would have been very expensive (also updates to temporary facilities to improve winterisation)	1	0	1	1	0	1
Not using the proper/specified type/parts of bamboo would mean it would only last 3-5 years	Use well-seasoned, inner part of the bamboo, not green and not the outer bark layers - specifications/requirements for bamboo use	Transitional learning centre design	1	0	1	1	0	1
There were no 'type designs' available before or immediately after the earthquake for Temporary learning facilities - these needed to be developed	Have designs for TLCs pre-prepared in case of an earthquake, including suitable weather considerations	Temporary/transitional learning facilities	1	0	1	1	0	1

Government:

Table H-3 – Catalogue of good practice and contexts for challenges relating to government, along with frequency of reporting, of both the item of good practice and the associated challenge.

Sub challenge	Good practice	Context/ relevance	Good practice reports			Challenge reports		
			High-level	Case-specific	Total	High-level	Case-specific	Total
Selection criteria for construction of transitional learning centres	Selection criteria for transitional facilities: teaching space over office space, younger classes prioritised, prioritise high levels of damage and schools with no permanent construction planned. Coordinate with central and district PIU's to select schools	Rigorous selection process. Transitional learning centres will only be built for classrooms, agreement at the start that the rooms won't be used for offices or other purposes, and younger children are prioritised, e.g. if only two classrooms are built, the younger grades will go in them (as older students are more able to escape easily if in other facilities, or staying in red-tagged buildings). Red tagged buildings have highest priority. Coordinate with CLPIU (when planning/selecting districts to work in i.e. identifying areas not allocated for permanent reconstruction), and DLPIU (district engineers, coordinating to select specific sites). Technical assessments in line with organisation criteria, donor requirements, feasibility .	1	0	1	1	0	1
Immediate recovery actions - CFS. Followed by TLCS, but some still hadn't been constructed 6months after the earthquake, and some didn't have a TLC provided, as permanent reconstruction was planned, but there were delays (up to 3 years). TLCs designed for 6months but many used for much over this, still in use 3.5 years later. There may be potential for transitional learning centres to be used in Western Nepal	Long term, realistic planning of recovery works to ensure adequate provision of temporary facilities until permanent reconstruction is complete, including the use of transitional facilities	Initially, very temporary structures – Child Friendly Spaces – tents, tarpaulins - mostly just to give somewhere where the children could go (many children had been traumatised), given fun activities to do, to help forget the event – these were supposed to be end after 3 months, and some were immediately replaced by TLCs, but in some places were still being used after 6 months, because they hadn't had a TLC constructed. Permanent reconstruction is slow and takes a long time, so schools are still reliant on TLCs even 3.5 years after the earthquake, despite their design life of 6 months No temporary shelter provided where permanent construction was planned, despite delays, in an area with seasonal roads and poor transport links. Transitional learning centres would be good to use in Western Nepal, where in the event of an earthquake, they would be very necessary, as many of the buildings there are very vulnerable (very few use cement). Should first construct temporary learning centres (build in one to two	2	1	3	5	1	6

		days), and at the same time can plan for transitional learning centres (important to have temp learning centres first so teaching can continue) (would be good to have recommendations for western Nepal from this research). After earthquake many organisations, INGOs etc. involved in planning reconstruction work, from CFS's to TLCs to permanent, and when these would happen, but those plans didn't work (due to topography, economic condition of the country, and others)						
Permanent construction takes a long time. Even 3-4 years after the earthquake, some schools not been assigned for permanent reconstruction, leaving a gap between temporary and permanent construction	Use transitional learning facilities for schools that have no permanent construction allocated, to provide more adequate mid-term learning space	TLCS: Made from bamboo – not sufficient for the length of time permanent construction will take – need transitional structures in the mean time (that are planned to last 3-5 years, although can last 10+years. (not many people constructing transitional learning centres - most just go from TLC to permanent and do not see the necessity of them). 650 Transitional learning centres have been constructed through EU funding, and now another 250 in 9 affected districts (including learning from delivering the first 650, including some structural and foundation changes). Transitional learning centres can be good, because in the years after an earthquake, there is little funds available so cannot construct as many permanent structures. But Transitional learning centres can cost 10x less than permanent construction, so could build many more transitional learning centres for the same money – more effective to distribute to all affected schools (more cost-effective), and the structure itself is also earthquake resistant (use lightweight materials so safer), (which often permanent construction ends up not being). Transitional learning centres used in remote locations where it is hard to construct, lots of challenges, difficult to transport materials, where government have not yet assigned to do permanent construction	1	0	1	1	0	1
Transitional learning centre life span 3-5 years, but in some places will be used for 10+ years	Maintenance of transitional facilities can extend life span - replacing infill wall materials increase life from 3-5 years to 10+ years	Transitional learning centres will be used for at least 10 years in some places where it is very difficult to transport materials. The expected life span is 3-5 years, due to wall materials, but by replacing/maintaining these infill materials, life span can be increased to more than 10 years, up to 20 years.	1	0	1	1	0	1

Learning from initial construction efforts	Have a process of design review, updating designs based on lessons learned e.g. changes to structure and foundation design	Have constructed 650 through EU funding, and now another 250 in 9 affected districts (including learning from delivering the first 650, including some structural and foundation changes).	1	0	1	1	0	1
Hard to find sufficient space to construct transitional learning centre design (and also tempLC and CFS)	Have a range of type designs for temporary/transitional facilities, to meet the needs of the school and the space available	Size of classroom designed for 25-30 students (same for TLCs and CFSs) – hard to find sufficient space/size, particularly in remote/hilly regions, in order to build. It is a typical design, so limited by that (the space available must be able to accommodate). Would work better if there were different types, so more flexibility of what to use where. (government have some typical designs for different topographies for permanent construction).	1	0	1	1	0	1
Fuel crisis/fuel blockade (political situation) affected transportation		shortage of fuel in months following earthquake	0	0	0	0	0	0
Overseeing/coordinating bodies and constitution were newly established following the earthquake - didn't have their own set up, so all new structures to adapt to, and organisation had a lack of capacity and weren't equipped to deal with the challenges	Set up a strong organisational structure to oversee and coordinate reconstruction efforts. Central level office to coordinate all school reconstruction, and support district offices who can locally support and oversee reconstruction in each district, equipping local level actors	Government restructure with new bodies to oversee reconstruction. CLPIU-education set up under MOE to oversee school reconstruction, and now after re-structure it sits under NRA. NRA was newly established, (reconstruction is mandate of NRA), local structures have been newly elected, with people's representatives, but they don't have their own organisational set up. Newly enacted constitution and local election. If you were able to translate and properly decentralise to a local level things would work better, but local level is 'like infant' – are not equipped to deal with this, they don't have the resources. Now working closely with DLPIUs – extended arm of CLPIU – has helped. Lack of strong local government has made reconstruction much more difficult, and will take time (5-10 years), to see this change	2	0	2	2	1	3
Lots of different political parties - local politicians would try and get involved in the projects and delay or stop them. Government is not strong with all the different parties, and struggle to satisfy them all	Engage with all the necessary stakeholders throughout a project, to minimise disruption to projects	Lots of different political parties - local politicians would try and get involved in the projects and delay or stop them as they were not consulted, or didn't know they were taking place, and were suspicious of where the money was coming from - they were trying to get money for other things, and getting investment in other areas. Would hassle the projects and cause delays	0	1	1	0	1	1
Due to limited budgets, several different organisations have run separate projects at one school to complete different	For smaller projects, SMC can be mobilised to oversee construction,	Schools have different buildings from different organisations (one is individual organisation, another part of a wider aid funding NGO programme, and one by	1	1	2	1	2	3

elements (including reconstruction and repair) - long process and several different sets of contracting process etc.	who are better placed with local stakeholders, labourers etc.	DLPIU, plus another donor for repairs to existing damaged building, which had previously been retrofitted) – means you end up with a mismatched school, long term disruption, have to go through contracting process etc. several times. For budget of max 20million NPR, can mobilise the SMC – particularly for inaccessible areas, where it is hard to transport materials (20Mill is upper limit, because beyond that, it would be beyond the capacity of SMC). – Good for smaller schools – this 20Mill comes from government funds (internal resource, not from the loans/grants)						
Working with schools across a wide area in very difficult locations makes it hard to engage with local masons, and retain them between projects. For one organisation: 3 projects run by same organisation - all in outskirts of same town, but travel still makes it difficult to visit more than one per day	If feasible, work with several projects in a smaller area and work to engage with local stakeholders and labourers, retaining labourers from project to project, monitor projects better for less cost	If projects are spread over a wide area, it is hard to engage with local masons, and once they are free they will move on to other projects. Organisations should then concentrate in one area, and not scatter programmes in many different locations. supervision, monitoring, coordination will be more visible, more comprehensive (if you are doing well, communities will praise, but communities will blame organisations if it is not going well) – important for different organisations to spread out across different locations. For one organisation, they focused on three schools all in the outskirts of one town/area (but still had transportation issues - 3.5 hours to the town (easy), but then up hill walk to get to school from the town (accessible by 4x4 but poor quality road, and that is more expensive). 3 projects spread around outskirts of the same town (too far to visit more than one a day)	2	0	2	2	1	3
Project identification and initiation	Utilise links with and work where organisations have prior links e.g. worked with schools before, worked in the area, worked with stakeholders during recovery - aids better engagement and have prior experience in that context	Case study 1: Headteacher had worked with a member of the implementing organisation during recovery work, so established a link that way - they had been assigned to construct three schools in the area. Case Study 2: School came into contact with the organisation during aid/recovery phase, when building materials were stored in partially damaged buildings at the school. Case study 3: Projects were through prior links with the schools before the earthquake, so decided to help them reconstruction. Chosen the ones in the worst conditions and where parents were illiterate, with less desire to send children to school (as they could stay home and	1	4	5	1	4	5

		help with farming etc.). General: School has prior experience of school construction in Nepal (Worked on about 500 schools before the earthquake), and worked with local government to conduct assessment of the schools in those two districts they had been asked to work in, and worked with local and central government to select schools. Priority was the schools the organisation had already worked with (About 80% were ok, but some were cracked)						
School selection and identification - Government works in accessible areas to construct, so this organisation works in more hard to reach areas, making accessibility more difficult	Site selection criteria: working in conjunction with local and central government to assess and select schools, working where there are the worst affected schools and the highest risk of children dropping out	Organisation has prior experience of school construction in Nepal (Worked on about 500 schools before the earthquake), and worked with local government to conduct assessment of the schools in those two districts they had been asked to work in, and worked with local and central government to select schools. Priority was the schools the organisation had already worked with (About 80% were ok, but some were cracked). Case study: Projects were through prior links with the schools before the earthquake, so decided to help them reconstruction. Chosen the ones in the worst conditions and where parents were illiterate, with less desire to send children to school (as they could stay home and help with farming etc.). General: Organisation opting/has to work in less accessible area as government work focussed in accessible areas	1	1	2	2	1	3
Selecting schools for reconstruction	Designate a specific focus on the project to help narrow selection of schools e.g. integrated schools - across multiple schools have a better understanding of needs	Biggest donors were ADB (committed to 300) and JICA - others then worked around them to select other schools. They focused on integrated schools	1	0	1	1	0	1
Project implementation	School initiating reconstruction, approaching MOE who designated an organisation to work with the school	School went to MOE and MOE/Plan were working together, and designated Plan to work at the school – funded by Australian Aid – Through Plan USA	0	1	1	0	1	1
Prioritising schools for reconstruction	Criteria for TLCs and permanent construction based on damage status and availability of alternate learning spaces such as community structures – utilising other facilities to reduce immediate demand	Government plans permanent construction based on some criteria, developed after the earthquake – initially for TLC construction, for the selection. Criteria include damage status, and availability of alternate rooms (such as community rooms that could be used instead – these	1	0	1	1	0	1

	(questions over safety of these facilities)	schools were therefore less prioritised, as many children were having to learn in just open ground)						
Schools vs housing	Utilise school reconstruction projects which benefit from full funding, with on-site supervision, technical support, especially when working with professional contractors, to help with technology transfer and embed skills into a community, and raise awareness of seismic resistant construction	CSEB projects (Generally for private housing, as schools and houses with grant support have some checking and approvals process (although some will avoid this)). General: In accessible areas mostly (although some in rural areas), using professional contractors on a project can help technology transfer through bringing skilled labour and equipment from around the world, and supervision from engineers - schools can be a learning centre, learning how to reconstruct, bend bars, cure concrete etc.	2	0	2	2	0	2
Difference in involvement of the organisation for school and housing projects - schools are donor funded which includes permanent on site supervision, while housing funding is limited, so more about training and equipping entrepreneurs to buy a brick making machine and build	Develop tools similar to those used in housing reconstruction, to remotely monitor school reconstruction	CSEB projects	1	0	1	1	0	1
Difficult to link housing and school reconstruction - governed and overseen by different bodies (no direct link, using different labourers etc.). One organisation: Original implementation plan to start with a school to embed technology less successful, as less support and funding for housing, particularly for vulnerable families, so needed to change approach to working through entrepreneurs	Utilise skills that have been introduced to communities through housing reconstruction and training projects, e.g. using those labourers in school reconstruction projects, working with a network of entrepreneurs within communities, or labour trained in school also involved in other reconstruction in the community	There are indirect links e.g. mason training on house reconstruction.. Funding organisation funding three schools in the surrounding area, but no practical or direct links between housing and other school reconstruction, e.g. different labourers being used . Another organisation: Network of about 100 entrepreneurs, who have received support and training from the organisation, who can then be used in future projects. Case study: NGO overseeing school reconstruction, but the same organisations also involved with other reconstruction in the community, and NGO supporting this e.g. through technical training and support for families. 450 (70% of eligible) households have been rebuilt within the community	3	0	3	3	1	4
Very few visits and checks from government after completion - 'I can count on one hand or less, how many schools have actually been visited by the government, after completion' - focus is on approvals, but not following this	Ensure checks (3-4 times thorughout the project) and regular supervision throughout project, using organisations independent to funding organisation for	A separate organisation provided the engineering and technical support, separate from funding organisation. Since the earthquake, the number of engineers and sub-engineers have increased, to increase the availability of technical support and supervision, to reduce the potential for construction going wrong	2	1	3	2	1	3

through to actual construction. Technical support - separate from funding organisation to not compromise quality, and have better transparency. Without adequate supervision, there is a higher risk of projects falling behind schedule, construction not following drawings and designs as labourers can't properly understand them and the technology	transparency, to ensure quality of construction							
Previously, money given to communities for construction was small, and not enough to ensure quality in the building	Provide full funding for projects, to ensure there are sufficient funds to guarantee quality – do not expect any contribution from communities	After the earthquake, full funds are provided for construction, and communities are not expected to make any contribution, particularly as many people are homeless and couldn't afford to give any funds or contribution	1	0	1	1	0	1
Complex approvals process - sent from office to office, and not clear who they needed to speak to - difficult to navigate when new to the field. Very variable process - 'Sometimes things happen quickly, sometimes they take time'. Government was not supportive. People do not know the approvals process and the reason it has been established, so don't follow the guidelines (and had to readjust to the new system when the government changed	If working over several projects, learn how to navigate approvals process and the requirements, to make this easier and quicker	Eventually got one of their own designs by an engineer approved, but complex process, being sent from office to office to get papers signed, at both central level and from local district offices – hitting barriers, and seen as an outside aid agency etc. so challenged about where the money was from, and how they were spending it – slowed progress and stopped project moving ahead. Designs took three months, but then another four months to get the approvals etc. , and then six months to actually construct. people do not know the process, and why the mechanism has been established, don't follow the design guidelines – just want to rebuild schools. But important that design is approved.	1	0	1	3	1	4
Strict building code enforcement after the earthquake (implementation was lacking before earthquake) - but Problems with getting approvals, delays in approvals process (one organisation for case study: originally told to wait by government until there were government approved designs, but didn't have these after two months)	Use an engineer within design process, to ensure that design is compliant with Nepal Building Code, and therefore make approvals process easier	Building codes set by government now compulsory for school design and construction. Approvals process can create delays. At the start of reconstruction phase, the government didn't have any pre-approved designs ready to go, but also weren't ready to approve any new designs	3	2	5	3	3	6
Approvals process is slow and bureaucratic, not very transparent - time consuming, having to go between several offices	Using a set of standardised, pre-approved designs across multiple projects will speed up approvals process for individual schools	Better now than it was, with new generations of government. Time consuming process, going from one office to another. Now have pre-approved designs. Have to make agreements with them, and once agreement is	2	0	2	2	0	2

		complete, need another one or two months for another agreement. They want to see the school, see pictures, data, drawings – takes time						
Approvals process doesn't apply to private schools	If a private school - approval not required, but a building permit should still be sought from the municipality, and design should be completed by an engineer, in line with building codes	Private schools still required to get a building permit through the municipalities, but some municipalities don't have this professional experience, and as this is a new structure/mechanism that has been implemented, there is not yet sufficient capacity to deal with this)	1	0	1	1	0	1
Funding school reconstruction - A large amount of funding required (building additional facilities than what had been present before the earthquake)	A wide range of funding streams available: government, NGOs, INGOs, personal donors, people from abroad, donations, charities	A lot of reconstruction to be done (more facilities than there were before), so lots of funding needed – gathered from a variety of sources. This needs to be managed properly - allows for more construction, but makes the overall reconstruction process more complex. For some schools, NGO solely oversees funding, but funds are provided by lots of different streams e.g. personal donations, foundations, national donors	1	2	3	1	2	3
Funding	Government funding SMC to manage and oversee construction	Funding organisation provided the funds to the SMC who oversaw and arranged all the construction (budgeting, buying materials etc.)	0	2	2	0	2	2
Funding requirements	Funding from NGOs and INGOs	Organisations funding is provided by global office (Global organisation) – the funding comes from a range of donors, some individual, some corporate and some foundations. Global office does some coordination with the donors (country office provides financial data, project data, information, pictures etc. from the field). Also report similar information to the government	1	1	2	1	1	2
Raising funds for reconstruction projects	Private donations and donors	Organisation contacted range of people to ask for donations - colleagues, ex-colleagues, oversees partners etc.	0	1	1	0	1	1
Different roles in the project for different stakeholders	Each stakeholder has a role to play within the project	Distinct roles for each - Engineer/implementer: technical support and guidance, almost daily supervision, training. School members: prepare construction site, supervise. Labour: hired from construction company, plus staff volunteers (given training). Government: assigning schools, checking progress and quality	0	1	1	0	1	1
Different roles in the project for different stakeholders	Technical design, guidance and supervision provided by an engineer (contractor, in house)	Distinct roles for each - Engineer/implementer: technical support and guidance, almost daily supervision, training. School members: prepare construction site, supervise. Labour: hired from construction company, plus staff	1	3	4	1	3	4

		volunteers (given training). Government: assigning schools, checking progress and quality						
Different roles in the project for different stakeholders	project management, overseeing progress, overall supervision, budget (by an organisation or SMC, or inc. consultation with school)	Distinct roles for each - Engineer/implementer: technical support and guidance, almost daily supervision, training. School members: prepare construction site, supervise. Labour: hired from construction company, plus staff volunteers (given training). Government: assigning schools, checking progress and quality	0	3	3	0	3	3
Different roles in the project for different stakeholders (Case study 1: Labourers were from community but not professional labour and although training provided, skill was low so they couldn't do things properly)	Labourers, to complete the construction work - hired from a construction company, labourers, local community, volunteers, or some work contracted locally. Some may require training if unskilled	Distinct roles for each - Engineer/implementer: technical support and guidance, almost daily supervision, training. School members: prepare construction site, supervise. Labour: hired from construction company, plus staff volunteers (given training). Government: assigning schools, checking progress and quality	0	3	3	0	3	3
Different roles in the project for different stakeholders	Government overseeing overall coordination and assigning schools, producing type designs, approving designs and checking progress and quality (i.e. through site visits receiving monthly updates)	Distinct roles for each - Engineer/implementer: technical support and guidance, almost daily supervision, training. School members: prepare construction site, supervise. Labour: hired from construction company, plus staff volunteers (given training). Government: assigning schools, checking progress and quality	0	3	3	0	3	3
Lack of ownership of projects by community and school	Engage with stakeholders throughout the process (building on any prior experience of this). Helps to improve ownership of project which can benefit. Community and school being involved, in facilities/requirements, and labour or material provision	Construction approx 500 schools in Nepal before the earthquake. Organisation had prior experience of school construction before earthquake, so had good awareness and experience of working with communities, school design/functionality, coordination with teachers and local government . Prior to earthquake, used a 'challenge, grant' model, where organisation would work with the community to work out the needs, and the likely costs, and would supply ~75% of the funds, and challenge the community to raise the other 25% locally. This isn't allowed within the post-earthquake context, government stipulates that it must be 100% funded. Organisation would say the old model worked better – develops a better sense of ownership over the project	1	0	1	1	0	1
Limited budgets so can't meet full needs of the school - School wanted two storeys to provide enough teaching space, but government didn't allow, so don't have enough classrooms/space. School want a surrounding compound	Liaise/consult with schools to understand the requirements can help to ensure school is fit for purpose, control costs and manage budget, and improve sense of ownership for the school	School is legally a partner in the construction project - NGO consulted with them in every decision made within the project	0	3	3	0	3	3

wall, but don't have the funds and haven't found an organisation to support								
Keeping track of progress and expenditure	Tracking progress and costs, to ensure projects are running on time and within budget	Organisation has a role dedicated to tracking the progress and expenditure of projects, and supervising implementation at the field offices	1	0	1	1	0	1
Administration aspects can cause delays (coordination at and between local and central government	Dual level support with local level providing better supervision and links between organisations and DLPIU, linking with central level planning and support to track overall progress of all projects	Field offices report to country office, for calendar/progress and expenditure, and offer a base from which to oversee projects. Organisation has an agreement with the government and NRA – agreement with the CLPIU for the schools. Agreement at central level to work in two districts, and then links with the two local level district offices. The organisations field offices – the engineers there coordinate with the DLPIU (district level offices). Local level can coordinate with local government and country office coordinate with central government. Field office coordinate with district client	1	0	1	2	0	2
Corruption within projects	Maintain transparency throughout the project, with funds and purchases, with regular supervision, a government registered bank account, tracking spending, to minimise corruption	Organisation haven't faced any issues of corruption, due to these good practice they use within their projects	1	0	1	1	0	1
3 modes of project initiation	Mode 1: mobilising SMC so that they are directly responsible for overall construction management, with technical and oversight role provided by DLPIU, engineers	For smaller school projects (about 75% of all school reconstruction projects)	1	0	1	1	0	1
	Mode 2: Philanthropic organisations and individuals responsible for management and overseeing school reconstruction projects (day-to-day supervision, quality, finances), and monitored in the field by CLPIU. Three way partnership between the organisations (NGO, INGO etc.), the CLPIU and the NRA. Hire contractors or work with community etc. to complete the work	Tri-partite agreements between NGO/INGO/individual/humanitarian partners, with CLPIU and NRA) Reconstructing through philanthropic organisations and individuals . (About 15% of all school reconstruction projects	1	0	1	1	0	1
	Mode 3: Government to government agreements, or multilateral bank	Hiring professional contractors (As stipulated through government to government agreements, or multilateral	1	0	1	1	0	1

	assistance (e.g. JICA, USAID, ADB - may stipulate needing to hire professional contractors to oversee and manage construction - completed through a tendering and bidding process	bank assistance e.g. JICA, ADB loan/grant, USAID) - done by tendering and bidding process (About 10% of school reconstruction projects)						
Assessing earthquake damage	Following the earthquake, conduct easy to understand damage assessments (red, yellow and green stickers), SIDA, and need requirements to identify and prioritise reconstruction	Immediately after the earthquake, World Bank led the Structural Integrity and Damage Assessment (SIDA) survey. - Worked with local and district offices and I/NGOS to survey status of damage and potential for merging schools (primary level) - target schools with worst damage and most students. (easy to understand and normal technical people could do it – based on ratings, and were very general, so normal people can identify the criteria (ratings were also connected with technical terms as well). 3 categories of buildings – completely damaged (red sticker), partially damaged (needing minor maintenance) (yellow sticker), and not structurally affected (green sticker) – these assessments could be used to assess school damage	2	0	2	2	0	2
	Based on damage assessments and size, schools are recommended by DLPIU for reconstruction - prioritised based on level of damage and number of students (smaller schools may be merged to decrease numbers to be rebuilt)	SIDA identified size of schools and potential for merging primary schools. Schools recommended by DLPIU, and if they have received a recommendation, they are eligible for reconstruction. Partner schools can select or identify schools, but it depends on them being recommended	1	0	1	1	0	1
	Set up a Memorandum of Understanding between CLPIU, NRA and the partner organisation, once a school is selected for reconstruction	Once schools are recommended/selected for reconstruction, a Memorandum of Understanding is set up with the CLPIU, NRA, and the partner organisations.	1	0	1	1	0	1

Community:

Table H-4 – Catalogue of good practice and contexts for challenges relating to community, along with frequency of reporting, of both the item of good practice and the associated challenge.

Sub challenge	Good practice	Context/ relevance	Good practice reports			Challenge reports		
			High-level	Case-specific	Total	High-level	Case-specific	Total
Balancing community expectation - viewed as an aid agency so community expected them to have more money (but they were a private organisation). Demolishing unsafe structures (temporary and damaged buildings) - communities reluctant. Very remote communities can be very sceptical of government and outside help - end up with corrupt 'local construction cartels'. Disagreements with communities over scale of work achievable within the budget (different expectations of quality) - community wanted more buildings built with the money that was available. Communities prefer RCC structures with slab roofs, so initially reluctant of transitional learning centre design. .. Lots of different political parties - local politicians would try and get involved in the projects and delay or stop them . Lots of different interest groups, with political divisions and personal interests	Communicate and negotiate with local stakeholders (community, school, SMC), and contractors about the decisions that have been made, the scope of the work, the importance of quality in design and the funding/spending, to help improve support, engagement and transparency	Different interest groups – politically divided, and can also be personally interested. Some are very supportive, but on a case-by-case basis – will vary from project to project. In one site, the TLC was unsafe/vulnerable because of poor site conditions – hard to get agreement of community – had to have a long meeting with the SMC, and head teacher outlining why, focus on life safety of the children, so they agreed in the end…. Prefer RCC structures, and not using CGI sheets on the roofs – prefer slab roofs. Hold orientations and briefings at the start of construction, about the structure, and the life span. (Some communities then want to adopt the technology, so in some cases, views must change). Very sceptical in very remote communities General: Haven't experienced problems, communities keen to be involved as they want schools to be built. Lots of experience with working with communities. Staff are trained on mobilising the community – start with community engagement, rather than directly with the school. During first visit, organise a meeting with the school management team, and then with SMC, and community and parents. Discuss the project, what is going on, costs etc., so that it's very transparent. Work with schools, in communities, and with local and central level government Case study 1: The money raised was enough to build 10 schools in the same standard as prior to the earthquake, but opted for 3 good quality, well designed schools – some	3	2	5	5	2	7

		complaints from the communities, that this was a waste of money. Community were annoyed that they didn't build more with the money – had to explain how they had got the money, why they were rebuilding the school, and how the money was spent, and how the project was run, to justify the spending (as the same money could have built much more, but lower quality). Because they were from an outside organisation, there was an expectation that they were an aid agency, so had a lot more money coming in. Lots of different political parties - local politicians would try and get involved in the projects and delay or stop them as they were not consulted, or didn't know they were taking place, and were suspicious of where the money was coming from - they were trying to get money for other things, and getting investment in other areas. Would hassle the projects and cause delays. General: Community involvement can be a positive for projects						
Hard for families to contribute when there is also the pressure of rebuilding homes, working and making money. School a long way from markets struggling with food shortages so construction not a priority. Finding ways to involve school in the process	Find ways for community to contribute to the project e.g. funding, or helping with demolition, sourcing materials, to improve engagement and ownership, even though not assisting financially - it is helpful to outline and define these clearly e.g. through a contract between NGO and community	Especially hard when houses haven't been rebuilt – hard for families to contribute to school reconstruction, which is favoured by donors. Lots of pressures of rebuilding house, working, making money. *reported in interview about other schools they know of. Schools up to 10 hours from a market. Case study 1: located in the forest/jungle, so the schools provided the wood from there to be used for doors etc. – paid for the cost of cutting, and the carpenters etc., but didn't have to pay for the wood. General: Always have a School Management Committee for reconstruction - involved in meetings and orientations, to make sure community was involved. Work closely with the local community as it is community based construction.	3	2	5	3	3	6

Populations in less accessible areas are more vulnerables - cannot stand up for themselves to 'demand' school is built	Work with communities for wider planning that will affect reconstruction e.g. road construction projects for accessibility	Half of sites they work in have year round vehicle access, some that is seasonal (not in monsoon), and some only accessible on foot	1	0	1	1	0	1
Community involvement varies from project to project, so is hard to predict.. Working with communities is difficult. Communities can expect more from larger, well known NGOs so less likely to contribute as much	Community involvement can vary between projects - can't make assumptions	Different interest groups – politically divided, and can also be personally interested. Some are very supportive, but on a case-by-case basis – will vary from project to project. Had positive experiences working with local or very small NGOs - communities don't expect a handout, so work/help in return for the support	2	0	2	2	0	2
Haven't experienced problems with engaging with local community	Train staff to engage with and mobilise communities (engaging with all stakeholders, first with community and then with school/SMC)	Haven't experienced problems, communities keen to be involved as they want schools to be built. Lots of experience with working with communities. Staff are trained on mobilising the community – start with community engagement, rather than directly with the school. During first visit, organise a meeting with the school management team, and then with SMC, and community and parents. Discuss the project, what is going on, costs etc., so that it's very transparent.	1	0	1	1	0	1
SMC, school construction committee have limited experience of managing projects	Provide 1 day training for SMC and local community for project management aspects (manage funds, keep records, do the accounts)		1	0	1	1	0	1
Previous approach of NGO driving the implementation, going in frest to a new place - wasn't working so changed approach	Work with/establish a network of local entrepreneurs	Very positive experience working with entrepreneurs - they invest their own money and work very hard - Have changed project approach, originally with BUN taking machine to community, and trying to hand over, now start with an entrepreneur, who invests large portion of their life saving, so one person will definitely be invested	1	0	1	1	0	1

Communities concerned over safety of public/government schools. Desire to use seismic resistant features reduces over time. Lots of buildings built before the earthquake have no safety measures	Work/engage with community to raise awareness of importance of, and using seismic resistant technology and disaster preparedness, and school safety - to encourage children to return to school, and to spread this knowledge throughout community	Some community members would come and look and ask how it was going, took an interest, watching to gain knowledge and copy in their houses - new knowledge. The earthquake highlighted importance of disaster preparedness, and disaster awareness has increased which has been positive. Following the school project, they started building houses using the same techniques – started being friends houses in the community etc. For temporary/immediate recovery: Initially provided with a tent, and then organisation provided a TLC. Children were returning to school because school was safer than homes. Communities can be concerned about the quality of public/government schools, especially at primary level, so want to send children to private schools (although actually less regulation). Immediately after the earthquake, people were keen to use seismic resistant features such as bands. But now, 3 years on, people are forgetting these and building without them – mostly on homes. Schools are better regulated, government have clear policy on it, so less of an issue there (Schools should be considered safe if built after the earthquake).	3	3	6	3	3	6
Lack of emergency funds to cope in a disaster	Encourage schools to set up an emergency fund to use in future disasters	School now wants to establish an emergency fund to use in future disasters	0	1	1	0	1	1
School grounds used to accommodate/shelter families who had lost homes . School closed for a month following the earthquake	Use safe/undamaged school buildings as shelter following an earthquake event	Many people came inside the school compound, and set up tents, in order to sleep there, while they couldn't use their homes. Government closed all the schools for a month following the earthquake	0	1	1	0	1	1
Children injured due to construction site. An unfinished building (needs plastering work and fittings etc.) being used for teaching older children (more capable of evacuating) - due to delays	Ensure safety of site during and after construction - facilities are safe before being used and work site is kept tidy and inaccessible during construction	Some children were injured, e.g. scratched by nails etc. that had been used in construction. Another school building had been used but that was downhill and prone to flooding and water damage due to rain, which prompted move to unfinished building	0	1	1	0	1	1

Children experienced trauma of earthquake, and were scared of returning to school	Run activities, entertainment, music, competitions and games to help boost morale and overcome fear	ran activities on return to school, to help children re-engage and overcome the trauma	0	1	1	0	1	1
Hard for communities to adopt/replicate construction of transitional learning centres. Schools reluctant for transitional structures - want permanent structures, but these take a long time to deliver. Concerns that transitional learning centres will be used as a permanent structure	*Transitional learning centres well received as they look permanent, bridging the gap - but important that they are only used for life span!*	Transitional learning centres: Community initially expecting something that looks temporary – are very impressed and pleased with how permanent the final structure looks – want to build more structures like it. However, hard for communities to adopt this, as the metal posts are hard to access/difficult to get (transported from far away markets usually), so not usually replicated. Schools say they don't want transitional learning centres, they want permanent structures. But they struggle to get permanent structures, so they are staying in bamboo structures. told that if they will be using longer than that, they should replace infill walls with bricks, stone etc., to extend last to 10-15 years. But don't think this will happen, will use it as a permanent structure	0	0	0	0	1	1
Meeting needs/capacity of the school (transitional learning centres)	Transitional facilities should be code compliant, have multiple standand designs, that can be used to meet required capacity of the school, and include accessible features, toilets/handwashing facilities	Transitional learning centres: Can build several buildings (all the same size) at one school, to meet the requirements of the number of children/classes. (must be separate buildings though, to be in line with building code – maximum of 3 times as long as the building is wide). Also have toilets and handwashing points included in the package, and there are features for disabled children too, such as ramps, and wider doors to accommodate wheelchairs	1	0	1	1	0	1
Earthquake caused disruption to teaching (3 months). Disruption to teaching caused by construction noise, when construction was near TLCs. Not enough safe space for teaching without TLCs	Ensure adequate temporary facilities for the duration of construction, where possible away from construction site, to minimise disruption	Case study 1: No lessons for 3 months – had to rent a room from the municipality to continue classes – rented with support from MOE, municipality and school. (some organisations had come, but only provided food and relief, but no construction) - rented facilities were not really fit for purpose, only one room for teaching and one toilet. Disruption minimised as the rented facilities were far away from the school site, so there was little disruption. Case	0	3	3	0	3	3

		study 2: There were separate facilities for teaching (Tent/TLC), so children could continue lessons, but close to the construction, so would have been disturbed by it (some months couldn't continue lessons as there was so much disturbance). Case study 3: Will stop using TLCs when reconstruction is finished. Without the TLC the school would not have been able to run all the classes. TLC was far away from the construction site, so disruption was minimised						
Lack of space for teaching in temporary/remaining facilities	Where enough temporary classrooms can't be provided, split teaching times, to reduce the number of students at any one time	Was a building available to teach in, but not enough space to teach all classes at the same time, so they split teaching across the day (College – class 11 and 12 – were taught 6-10am, and then main school after 10am)	0	1	1	0	1	1
Unforeseen/ unanticipated requirements can result in increased costs. Poor facilities can lead to poor quality of education delivered. Pre-earthquake classrooms were poor quality, dark with poor air quality, and badly damaged in the earthquake Case study1: School still lacking a purpose built hostel facility so using a spare classroom	Work with school to design new facilities to be improved (more facilities, better quality, toilets, hostels, sufficient light and air, water supply) - BBB	Often start in initial meeting identifying what the school requires (number of classrooms etc.) and what design will accommodate this. But then in future visits may identify additional needs, e.g. retaining wall for a slope, a water source. These can be unanticipated and increase costs. Case study 1: Before only had 2 rooms – now have 6, although would like a separate hostel building as some children have come from far away for the deaf facilities. School inform the government of what they need and then the partners built this. Some schools have residential elements e.g. hostel - these could be incorporated into design (currently have to use a spare classroom). Case study 2:School rebuilt all 10 classrooms. Previously only one toilet, and now have separate boys and girls toilets. Case study 3: Constructing more classrooms and additional facilities (science lab, library, computer lab, new disabled access toilets). School provided ideas of needs and requirements for the buildings to the engineers designing. After the reconstruction, can now offer quality education – there are sufficient learning spaces, more	1	5	6	1	5	6

		students can be enrolled, and can offer higher levels of education (target to have class 11 and 12 as well). Designing classrooms to ensure sufficient light, and placement of buildings to get good natural air flow. This has improved morale and higher educational aspirations. Case study 4: Quality of previous facilities very poor – badly damaged – but now have good buildings and better facilities, and better furniture and toilets. Also provided carpets, so that the floor wasn't as cold during the winter, and cushions for the young kids to sit on, rather than the floor. Also solar power, so they could have fans during the summer when it is very hot, and for speakers, laptops etc. which were also provided – improve quality of education. Case study 5: consultation with NGO and school throughout whole process so school can be involved in decision making						
Additional cost of fitting out new facilities with furniture and equipment (not necessarily included in reconstruction cost) (and furniture available at local level can be poor quality. Previous facilities were badly damaged	Additional educational benefits e.g. including furniture within consideration (can be expensive and may need to be sourced from KTM), carpets, solar power to power technology e.g. laptop, and educational programmes, to ensure that quality of education is good in the new facilities	Also linked with other organisations, providing school equipment such as school bags, and international students coming to the school to teach/work, some for a month, some for 10 months. Case study 1: With lots of new facilities (science lab, computer lab, library), there are additional costs for fitting them out, not necessarily included, so additional money needed. General: Classroom furniture included in the reconstruction, as part of the agreement, but furniture available at the local level was poor quality, so agreement changed with the school, and supplied from Kathmandu instead. And growing flowers in open mud areas to be environmentally friendly. Organisation runs two programmes – literacy programs, and girls education programmes, working in government funded schools. These work to improve reading habit and skills of children. Working in both library and in instruction. But to achieve this, need good learning environment, i.e. good	2	3	5	2	3	5

		classrooms. Changed focus of the organisation so that construction of classrooms became an integral part of achieving the goal. Once school buildings/classrooms are constructed, organisation then works with the school to implement a literacy programme. (3 years) – work closely/engage with families, as parents are key stakeholder for students to learn. Case study 2: Quality of previous facilities very poor – badly damaged – but now have good buildings and better facilities, and better furniture and toilets. Also provided carpets, so that the floor wasn't as cold during the winter, and cushions for the young kids to sit on, rather than the floor. Also solar power, so they could have fans during the summer when it is very hot, and for speakers, laptops etc. which were also provided – improve quality of education						
Some families reluctant to send their children to school as they can work on farm land and in the homes	Providing lunches and incentives for schools to encourage children to attend	Case study 1: Many families are poor, and would like to keep children at home, so that they can help on farm land and in the house, but struggle to afford to feed their children, so by providing lunch, parents have an incentive to send their children to school so they can have a meal (and makes sure that the reconstructed school will actually be used and worth while). Case study 2:Also government provided money for snacks to feed the children (managed by internal monetary fund of the school)	0	2	2	0	2	2
Access for disabled students	Improve accessibility of facilities - better for disabled children, and also for evacuation (2 doors/classroom, ramps, disabled access toilets)	Better accessibility, and safety considerations included within the design, to improve evacuation possibilities (including accessible features e.g. ramps, disabled toilets) (some of these were at schools specifically for disabled children)	0	2	2	0	2	2
A large amount of funding required (building additional facilities than what had been present before the earthquake)	Different funding sources across the multiple buildings (NGO, school raising funds, partner schools abroad)	A lot of reconstruction to be done (more facilities than there were before), so lots of funding needed – gathered from a variety of sources	0	1	1	0	1	1

Schools had limited say in the process	School had limited involvement, due to funding mechanism – organisation oversaw all aspects.	Schools didn't get much say – had clauses with them that the organisation will be doing everything, because the money was donated, and wanted transparency over what was spent and how the money was being used.	0	1	1	0	1	1
Project identification/selection	Utilise existing and ongoing links with communities and schools when initiating reconstruction projects can improve engagement	Projects were through prior links with the schools before the earthquake, so decided to help them reconstruction. Chosen the ones in the worst conditions and where parents were illiterate, with less desire to send children to school (as they could stay home and help with farming etc.)	0	1	1	0	1	1
Project identification/selection	Prioritise worst affected schools and those at most risk of children dropping out	Projects were through prior links with the schools before the earthquake, so decided to help them reconstruction. Chosen the ones in the worst conditions and where parents were illiterate, with less desire to send children to school (as they could stay home and help with farming etc.)	0	1	1	0	1	1
Long term links for maintenance	Work with schools long term, to oversee maintenance throughout the following years	These longer term links also mean that they can oversee school maintenance as well, with an annual data collection over the tree years, checking for cracks, any damage, if locks/doors/windows etc. are broken – can take pictures, advise etc.	0	1	1	0	1	1
Ensuring quality in construction	Multilevel checks from engineers to check quality	Frequent visits from implementation NGO engineer, and several visits from district DLPIU engineer too, and municipality engineer and mayor visited, to do checks on quality	0	1	1	0	1	1

Accessibility:

Table H-5 – Catalogue of good practice and contexts for challenges relating to accessibility, along with frequency of reporting, of both the item of good practice and the associated challenge.

Sub challenge	Good practice	Context/ relevance	Good practice reports			Challenge reports		
			High-level	Case-specific	Total	High-level	Case-specific	Total
Reconstruction falling behind in less accessible areas, and more expensive to build in remote areas, that are affected by seasonal roads and road blockages	Coordinate with road reconstruction and protection projects, to ensure suitable roads to the school - work with local communities to reconstruct seasonal roads, or work in conjunction with plans to build retaining walls to protect vulnerable roads	Half of sites they work in have year round vehicle access, some that is seasonal (not in monsoon), and some only accessible on foot. Case study: One of the roads to the town gets blocked, but in last year of construction, an additional retaining wall was built. Construction took approx 2.5 years but only 7-8 months of effective construction, due to interruptions and lack of man power, because of reconstruction of houses, and issues of accessibility (poor condition of roads, logistical problems, road blockages, elections)	1	1	2	1	1	2
Seasonal road and poor transport links caused stopped project for three years for one school	*Ensure temporary facilities are in place to cover delays*	seasonal road, poor transport links	1	0	1	1	0	1
Central areas being reached first, even in remote districts, and some remote locations are being neglected by private organisations. But Government also works in more accessible areas, so leaves other organisations to work in harder to reach areas where accessibility is more difficult. There was also more damaged schools in rural locations due to poor construction, so there is higher demand, as well as greater additional challenges/pressures e.g. food shortages due to difficulties reaching markets. There are also challenges of classification of 'rural', as some rural areas are still covered by a municipality, so rural challenges are underappreciated	Planning/ distribution of projects to cover all areas - government working in areas with greater demand, and that donors have not reached, and vice versa	14 most affected districts - mostly hilly areas. Most rural schools constructed using mud mortar, or mud mortar infill with steel frame, but not tied together properly while urban areas used cement, RCC frame, so performed better, (and KV ground shaking was less than predicted, and previous retrofitting in KV which all performed well). Organisation opting/has to work in less accessible area as government work focussed in accessible areas (transitional learning centres). One participant: *reported in interview about other schools they know of. Schools up to 10 hours from a market (though this school quite close to local market)	2	0	2	3	1	4

School has direct road access but seasonal, and very poor quality, still being rebuilt after monsoon (left a 10 min walk downhill to reach school). Often have seasonal roads which affects transportation of materials, so can't work in rainy season (June to September), or if work continues, risk is higher and progress slower. Hill/mountainous terrain and poor road quality (temporary/no roads, and bumpy) - very expensive to transport materials. Monsoon caused delays/stopped construction work for 5-6 months, leaving almost unfinished building . Landslides blocking road to the main town during rainy season - blocked bricks getting to the school. No good road to the school because of a landslide	Avoid working and starting projects during monsoon season in areas accessible by seasonal roads	Many projects affected by seasonal roads, affected by monsoon and landslides. Hill/mountainous terrain and poor road quality (temporary/no roads, and bumpy) . Road was in use during construction of first building but affected during second. For one case study: road to town blocked, but school on the outskirts of the local town so from there easy access to materials. CS: One of the roads to the town gets blocked, but in last year of construction, an additional retaining wall was built. Construction took approx 2.5 years but only 7-8 months of effective construction, due to interruptions and lack of man power, because of reconstruction of houses, and issues of accessibility (poor condition of roads, logistical problems, road blockages, elections)	1	2	3	1	5	6
A problem to bring materials in during rainy season - Difficult to transport materials (started project during rainy season) (Relatively easy after rainy season)	Transport materials before the monsoon, if there is adequate, safe storage available	Seasonal road - affected by monsoon. Started project during the rainy season (materials came from nearest town, but some had to be bought from KTM)	0	1	1	0	2	2
Transport and access to some sites is difficult, harder to bring in materials, and more expensive	Designate sites for transitional learning centres as easy, medium and hard - contractor given more money for transportation costs for harder sites, so less issue to transport materials	Areas of easy, medium and hard accessibility (for delivery of transitional learning centres)	1	0	1	1	0	1
Some rural areas are difficult to get to and transport construction materials to (may be only by foot or reliant on mules)- difficult to delivery permanent construction (some areas 8-10 hours on foot from road). If more than 8 hours, very difficult to bring metal posts, rebar, cement etc.. This can cause delays to projects. For one school, the roads to the main town were ok, but the ones from there to the schools were much worse, so transport was difficult, and walking was preferrable when visiting. And accessibility can also be affected by political	Use lightweight materials that are easy to transport, especially when need to porter on foot	Areas with no vehicle access - 8-10 hours walk from a road (Interview focused on transitional learning centres). Transitional learning centres were most common in areas with low accessibility. Case study 1: *This school on outskirts of town, but other schools further from the town struggled more. Case study 2: 3.5 hours to the town (easy), but then up hill walk to get to school from the town (accessible by 4x4 but poor quality road, and that is more expensive). 3 projects spread around outskirts of the same town (too far to visit more than one a day).	1	0	1	2	3	5

situation, decreasing availability, e.g. fuel crisis/blockade limited vehicle availability.		Roads blocked by fuel blockade, and limited transport due to fuel shortage (temporary/short term/early phase issue, no longer has an effect). Case study 3: Construction took approx 2.5 years but only 7-8 months of effective construction, due to interruptions and lack of man power, because of reconstruction of houses, and issues of accessibility (poor condition of roads, logistical problems, road blockages, elections)						

Land:

Table H-6 – Catalogue of good practice and contexts for challenges relating to land, along with frequency of reporting, of both the item of good practice and the associated challenge.

Sub challenge	Good practice	Context/ relevance	Good practice reports			Challenge reports		
			High-level	Case-specific	Total	High-level	Case-specific	Total
Hard to find suitable land in higher hills. Schools often built or located on donated land in difficult locations. Some sites not suitable for construction, particularly those allocated by communities which is often vulnerable. Landslide next to school during construction. Poor quality water supply at the school. Mountains are young, so geological formation is very fragile	Assess safety of school sites and identify potential hazards - detail checklist to help with site selection (e.g. no risk of landslide, flooding, liquefaction, avoid sites with loose soil, on the sides of rives or in landslide zones)	Depends on the location - particularly higher hill areas. In some cases may have to build on a particular terrace that isn't totally suitable or meet minimum requirements, but no other options available so risk getting no school. If totally unsafe, may not go ahead with the school project (This organisation had one school that didn't get built). Previously schools were constructed on land donated by communities, but often this was the poor quality land that people didn't want to use for other purposes, so there were risks and hazards associated with it. Do now have an awareness that schools should be built on better land. Transitional learning centres: When selecting sites, have developed a detailed checklist of where they can and cannot build. Difficult when allocated sites by the community – allocate the land which is not used, e.g. on the side of a river, or in landslide zones – vulnerable land. Even when taking care of these things, still some sites affected by landslides and monsoon. Where there is no other space available and the school definitely needs it, can make a special case, and construct retaining structures (e.g. toe walls), but generally try to avoid those sites. Also need to pay attention to geology of the site, sites that have loose soil should be avoided. Should be no risk of landslides, flooding, liquefaction. Case study: funding organisation constructed a retaining wall to prevent further damage and improve safety – brought in a geologist to do the foundation, and someone came to supervise every 2 or 3 days, would work together to overcome problems. Case	3	2	5	4	3	7

		study: Sites may have a risk of landslides - but flatten land, and retaining wall to mitigate, and perform soil tests. Case study: Water was brought to the school from a stream 2-3 km away, from private property						
Some sites not suitable for construction, particularly those allocated by communities which is often vulnerable	Avoid sites with additional hazards e.g. close to rivers, landslides/flood zones	Transitional learning centres: When selecting sites, have developed a detailed checklist of where they can and cannot build. Difficult when allocated sites by the community – allocate the land which is not used, e.g. on the side of a river, or in landslide zones – vulnerable land. Even when taking care of these things, still some sites affected by landslides and monsoon. Where there is no other space available and the school definitely needs it, can make a special case, and construct retaining structures (e.g. toe walls), but generally try to avoid those sites. Also need to pay attention to geology of the site, sites that have loose soil should be avoided. Should be no risk of landslides, flooding, liquefaction	1	0	1	1	0	1
Schools often built or located on donated land in difficult locations	Schools should be built on good quality, safe land (not necessarily the original school site)	Previously schools were constructed on land donated by communities, but often this was the poor quality land that people didn't want to use for other purposes, so there were risks and hazards associated with it. Do now have an awareness that schools should be built on better land	1	0	1	1	0	1
Schools often built on donated land, not suitable for school construction. Expensive to demolish and remove old, damaged building	School to be constructed on same land/plot as previous building (only if safe/suitable) - may require demolition of previous damaged buildings	Construct school on the original land the school was built on, Built on different terraces, steep contours, steep hill slopes that are vulnerable to landslides. This counts towards the greatest costs in the project (as well as not knowing ground conditions)	0	2	2	2	2	4
Unforeseen/ unanticipated requirements can result in increased costs. Some sites not suitable for construction, particularly those allocated by communities which is often vulnerable. There was a landslide next to the school during construction. Land for school construction was sloped and needed to be flattened before construction	Overcoming/ mitigating challenges with land e.g. flattening sloped land, or constructing retaining walls to reduce landslide risk	Often start in initial meeting identifying what the school requires (number of classrooms etc.) and what design will accommodate this. But then in future visits may identify additional needs, e.g. retaining wall for a slope, a water source. These can be unanticipated and increase costs. Transitional learning centres: When selecting sites, have developed a detailed checklist of where they	2	3	5	2	3	5

started. School site is very windy and lots of dust from the road gets blown into the grounds		can and cannot build. Difficult when allocated sites by the community – allocate the land which is not used, e.g. on the side of a river, or in landslide zones – vulnerable land. Even when taking care of these things, still some sites affected by landslides and monsoon. Where there is no other space available and the school definitely needs it, can make a special case, and construct retaining structures (e.g. toe walls), but generally try to avoid those sites. Also need to pay attention to geology of the site, sites that have loose soil should be avoided. Should be no risk of landslides, flooding, liquefaction. Case study: funding organisation constructed a retaining wall to prevent further damage and improve safety – brought in a geologist to do the foundation, and someone came to supervise every 2 or 3 days, would work together to overcome problems. Case study: Sites may have a risk of landslides - but flatten land (using big diggers, and retaining wall to mitigate, and perform soil tests						
Schools often previously built on poor quality land (slopes, small sites). Unforeseen/ unanticipated requirements can result in increased costs	Designing for the space available, following site inspections - requires flexibility of designs	Particularly a problem in hilly areas (most of the affected districts are hilly). Schools are often given the poor quality land that others don't want (not suitable for farming or houses), so often slopes, or a very small area. Don't always know if the land that has been identified (even by an SMC) belongs to the school, belongs to government, has a licence etc. Often start in initial meeting identifying what the school requires (number of classrooms etc.) and what design will accommodate this. But then in future visits may identify additional needs, e.g. retaining wall for a slope, a water source. These can be unanticipated and increase costs	1	0	1	1	0	1

Not knowing in advance what is below the ground at the start of a project - can be expensive. Lots of stone in the ground - hard to break this up which caused lots of delays. Poor ground quality required very deep foundations, which are more expensive	Account for unknowns in ground conditions before construction begins, which may require additional funds - Adapt foundation design based on ground conditions at the site e.g. deeper foundations in poor quality ground	If there are lots of rocks in the ground (especially if you can't investigate at the start due to old building still needing to be demolished) - need to build bigger foundations to accommodate this, which can increase costs	1	1	2	1	2	3
Disputes and misunderstanding over land ownership causes delays	If land was donated, ensure suitable permissions and rights are in place for ownership of the land	Construction start delayed by 3-4 months due to misunderstanding over land ownership - land is owned by another organisation so school had to get rights to build on the land	0	1	1	0	1	1
Needed permission from Ministry of Forestry to cut down trees on the land	Ensure necessary permission is sought for all aspects of work e.g. cutting down trees	Approached government authority (Ministry of Forestry) to get permission to cut them down – permission granted as soon as possible	0	1	1	0	1	1

Appendix I:

Decision trees

Appendix I. Decision trees

1. Government: Stakeholder roles (1/6)

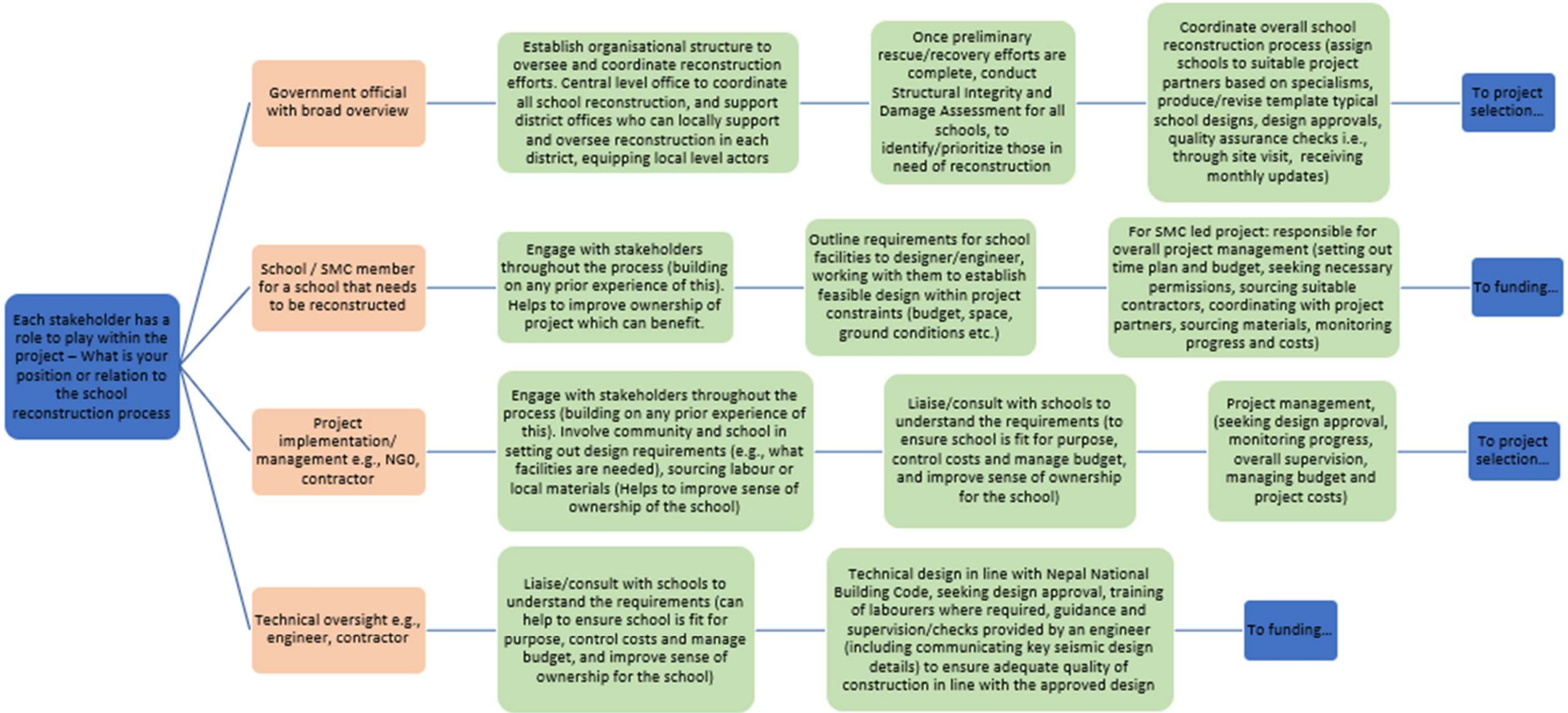


Figure I-1 – Government decision tree, part one of six.. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

1. Government:
Project selection (2/6)

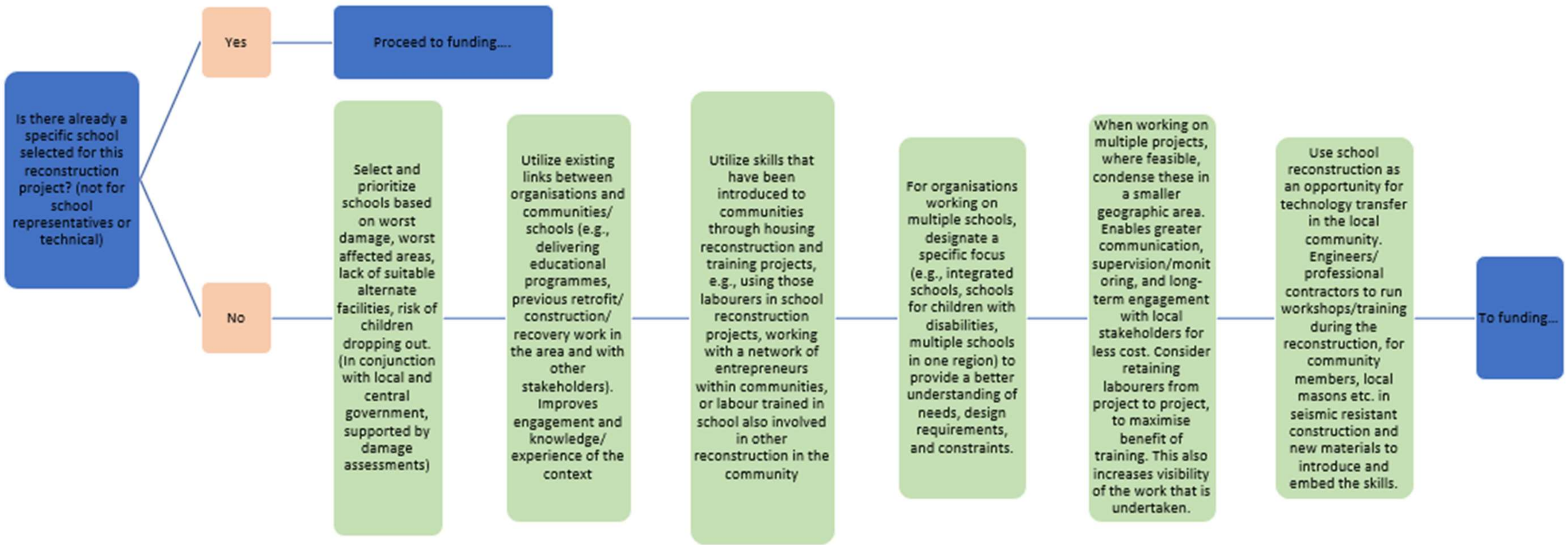


Figure I-2 – Government decision tree, part two of six. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

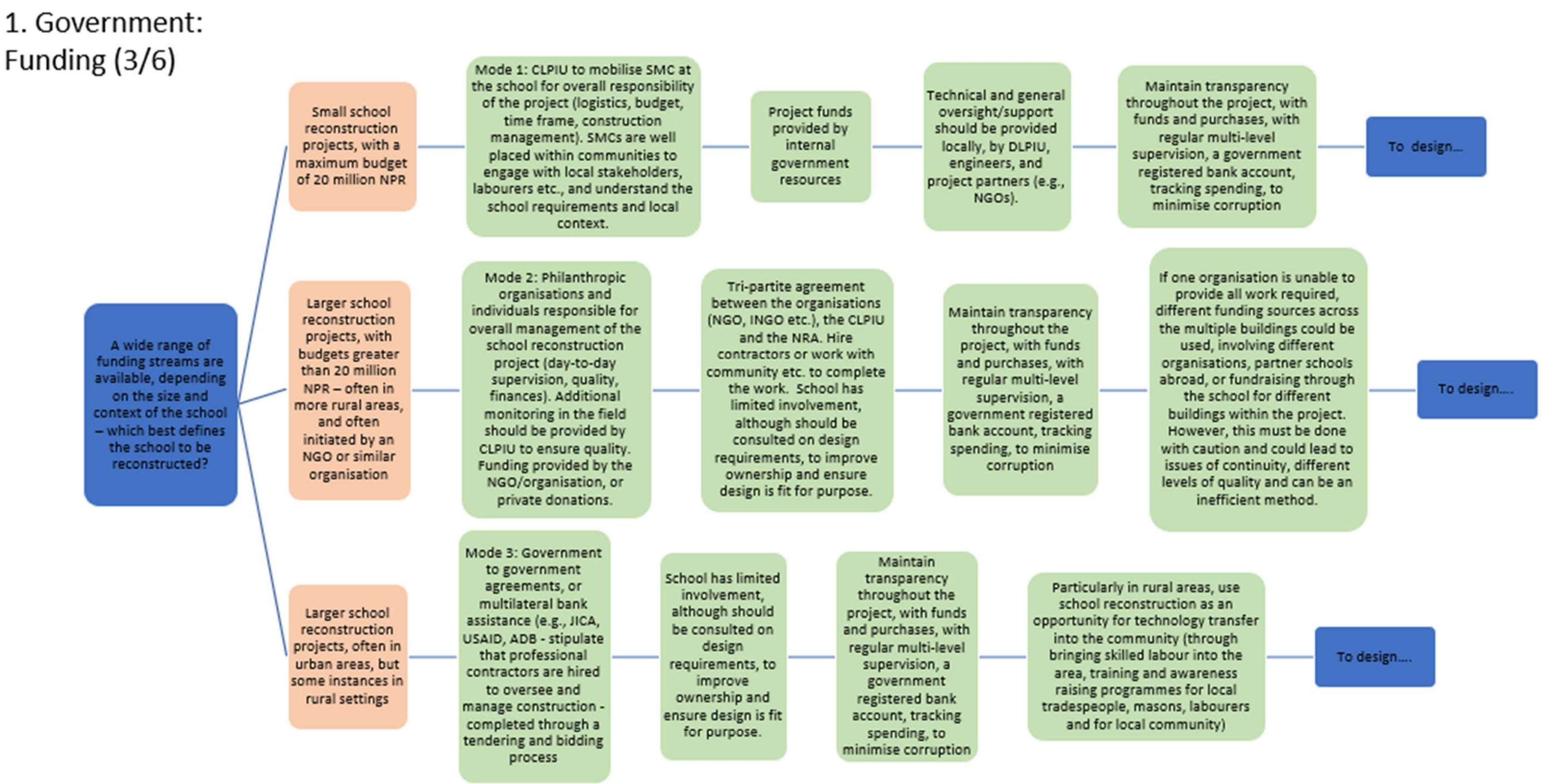


Figure I-3 – Government decision tree, part three of six. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

1. Government:
Design (4/6)

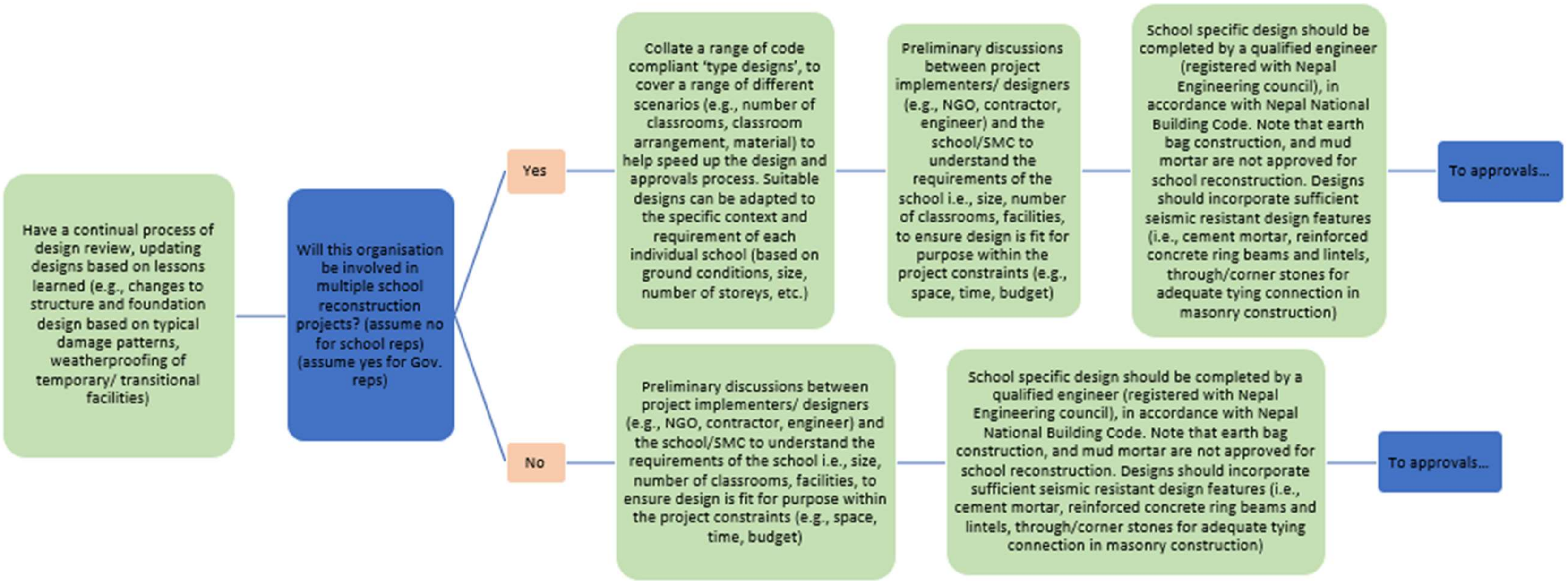


Figure I-4 – Government decision tree, part four of six. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

1. Government: Approvals (5/6)

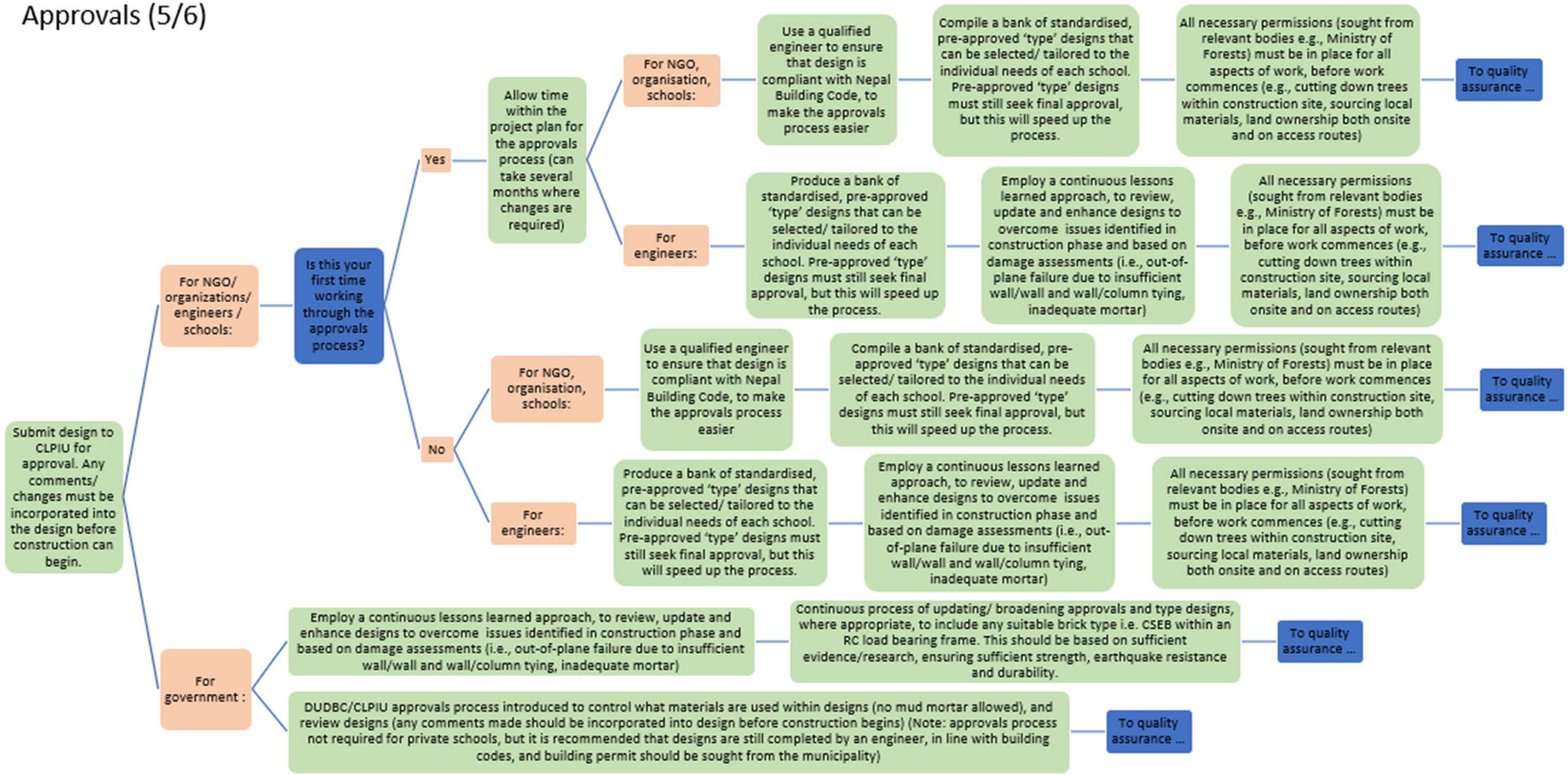


Figure I-5 – Government decision tree, part five of six. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

1. Government:
Quality assurance (6/6)

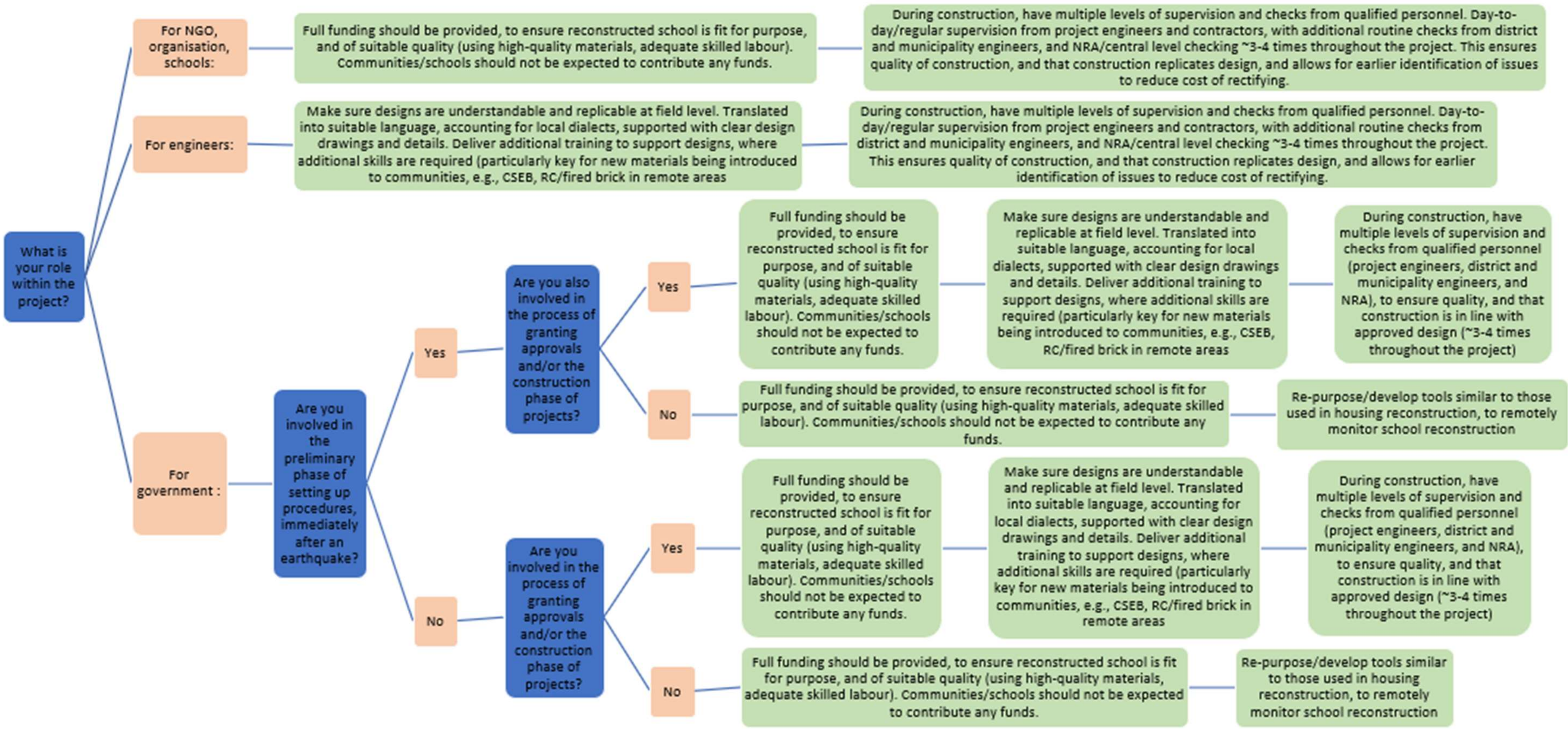


Figure I-6 – Government decision tree, part six of six. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

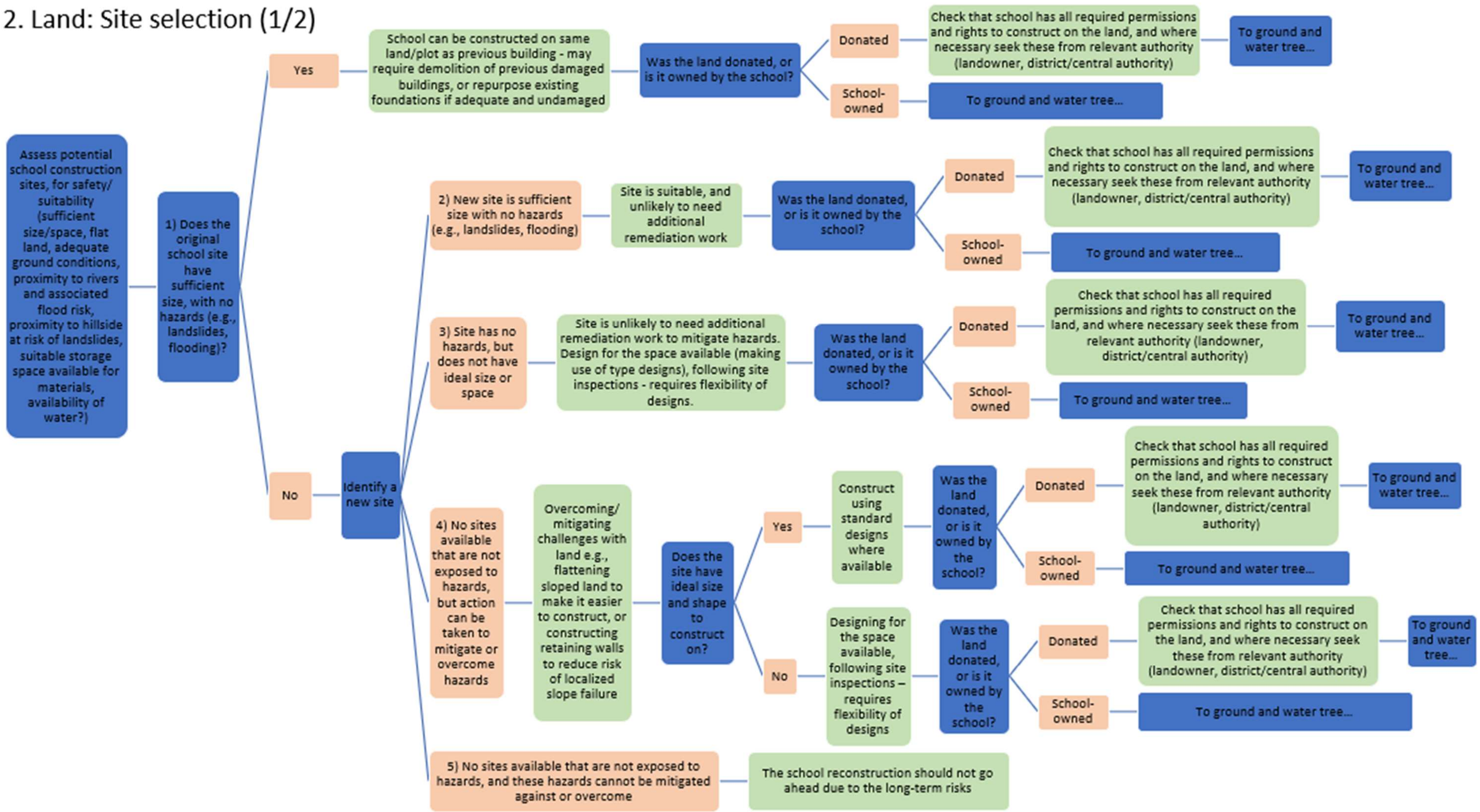


Figure I-7 – Land decision tree, part one of two. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

2. Land: Ground/water (2/2)

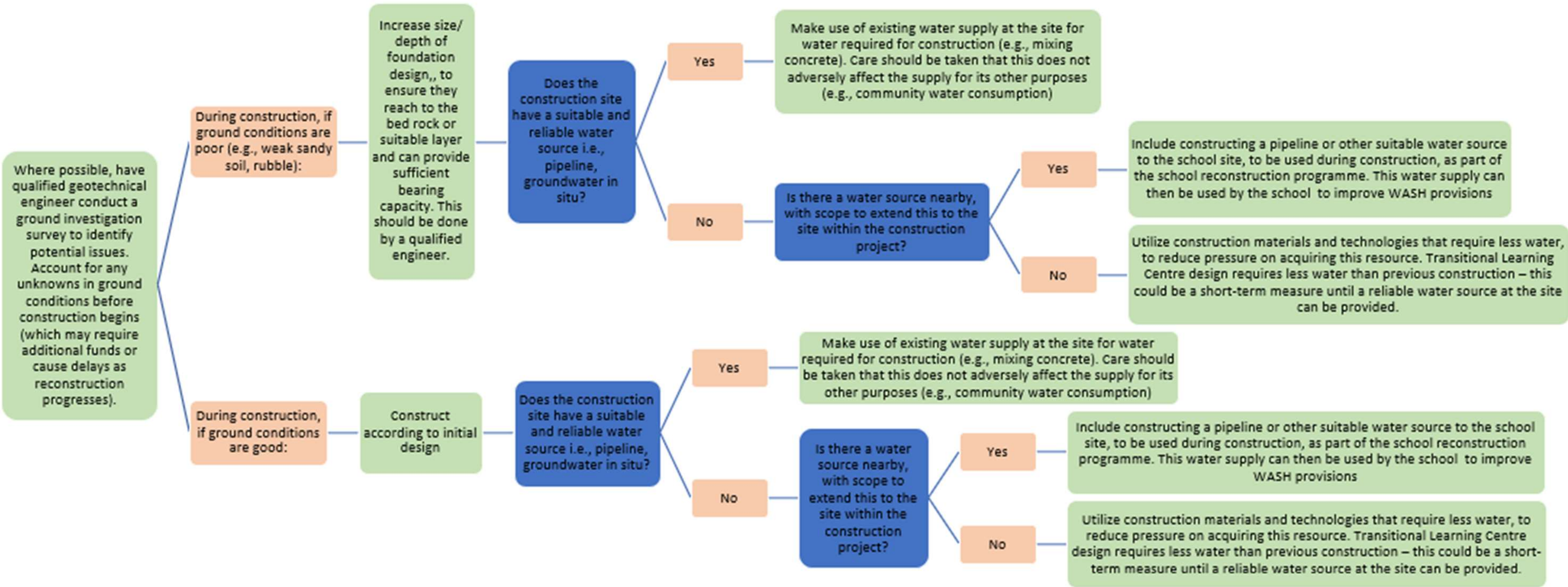


Figure I-8 – Land decision tree, part two of two. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

3. Accessibility (1/1)

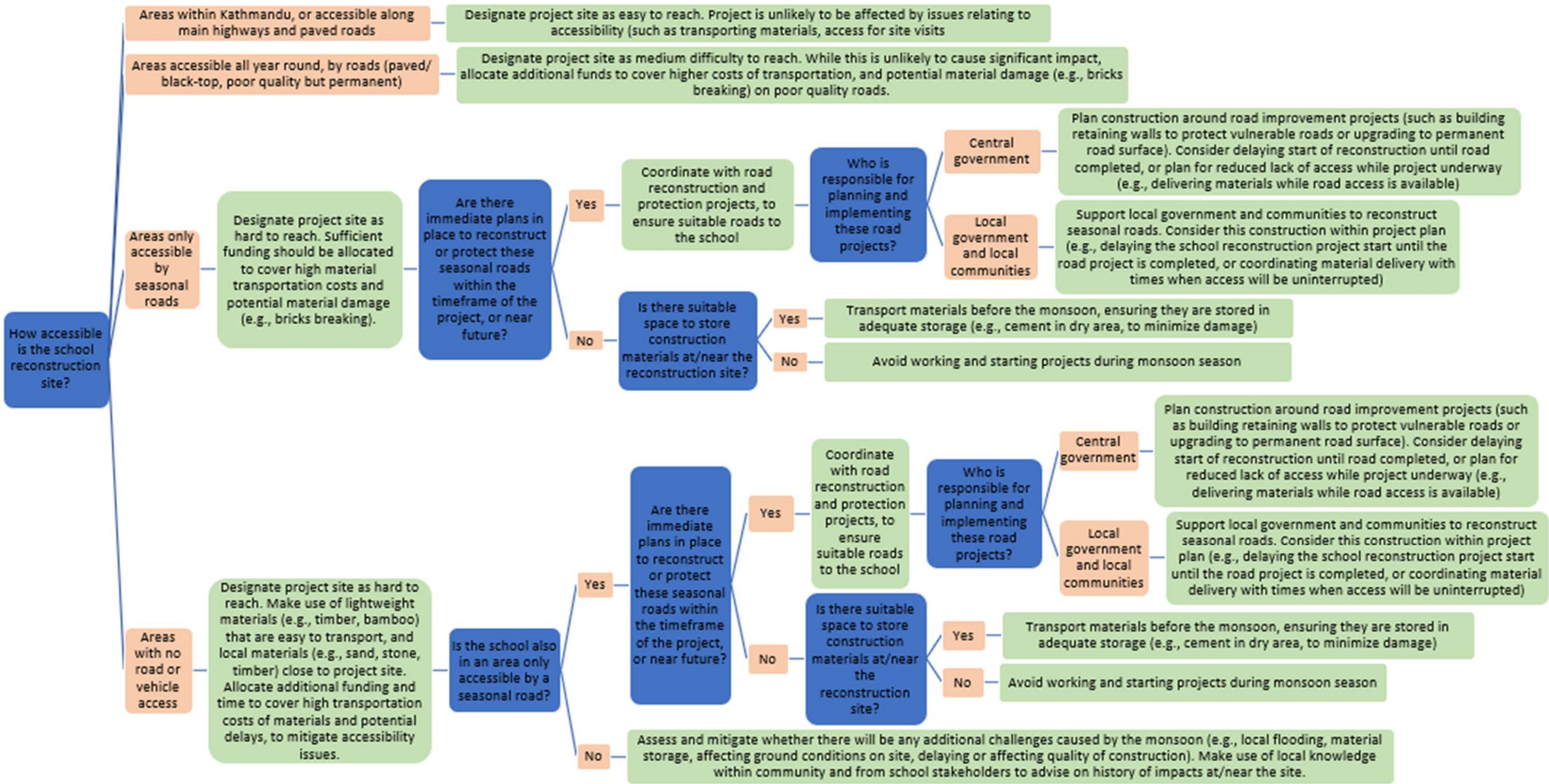


Figure I-9 – Accessibility decision tree, part one of one. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

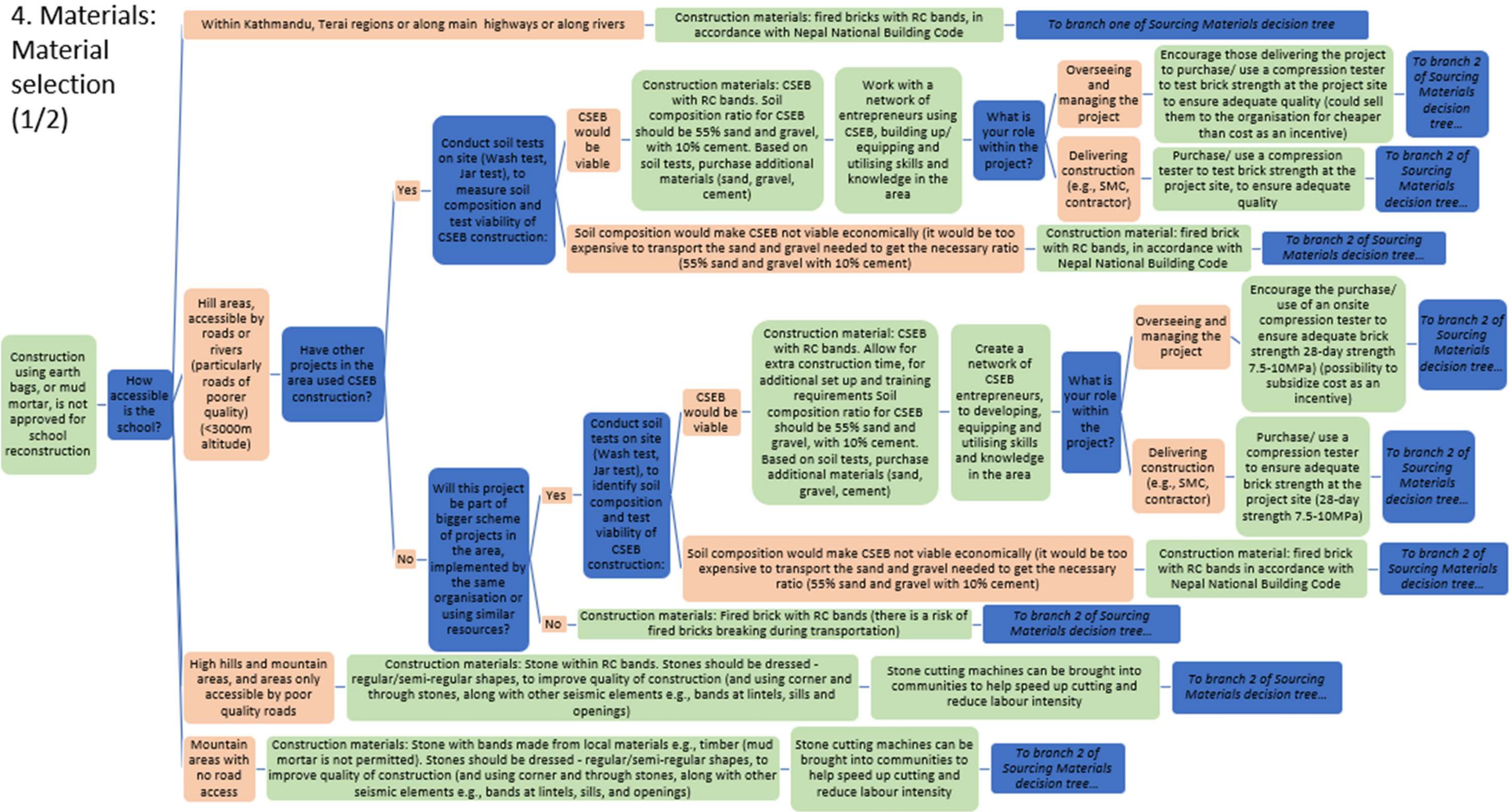


Figure I-10 – Materials decision tree, part one of two. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

4. Materials: Sourcing materials (2/2)

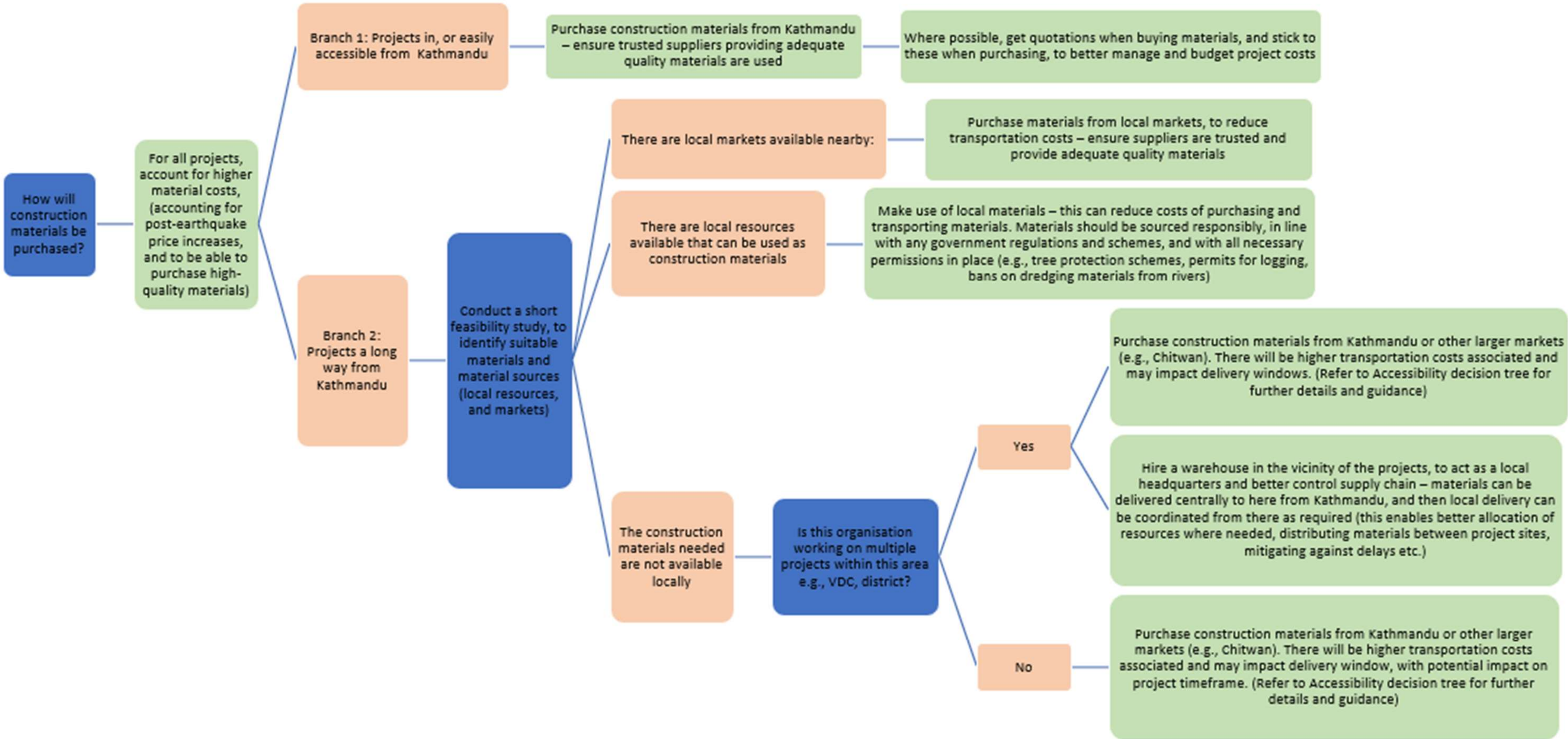


Figure I-11 – Materials decision tree, part two of two. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

5. Labour (1/1)

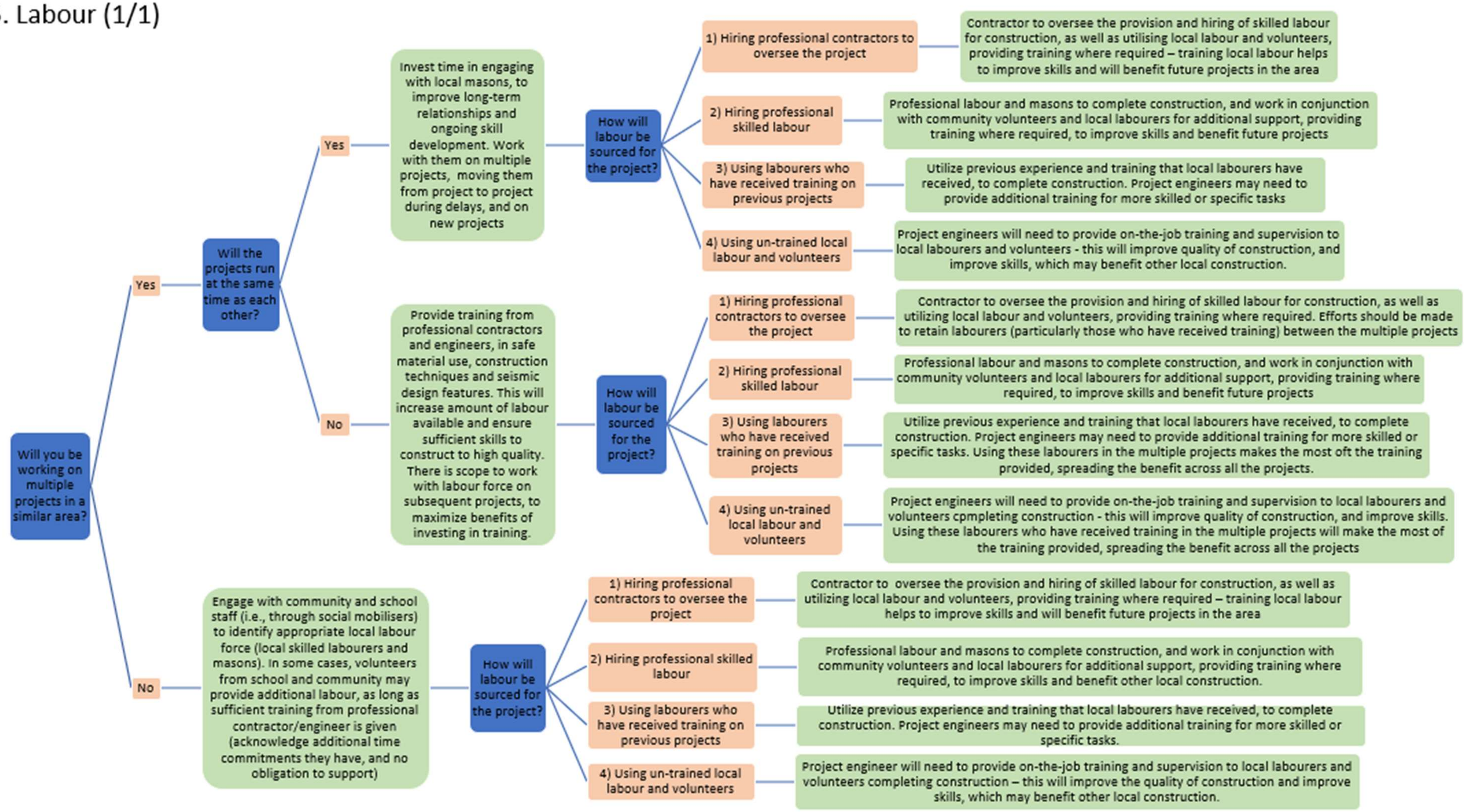


Figure I-12 – Labour decision tree, part one of one. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

6. Community: Immediate/short term (1/5)

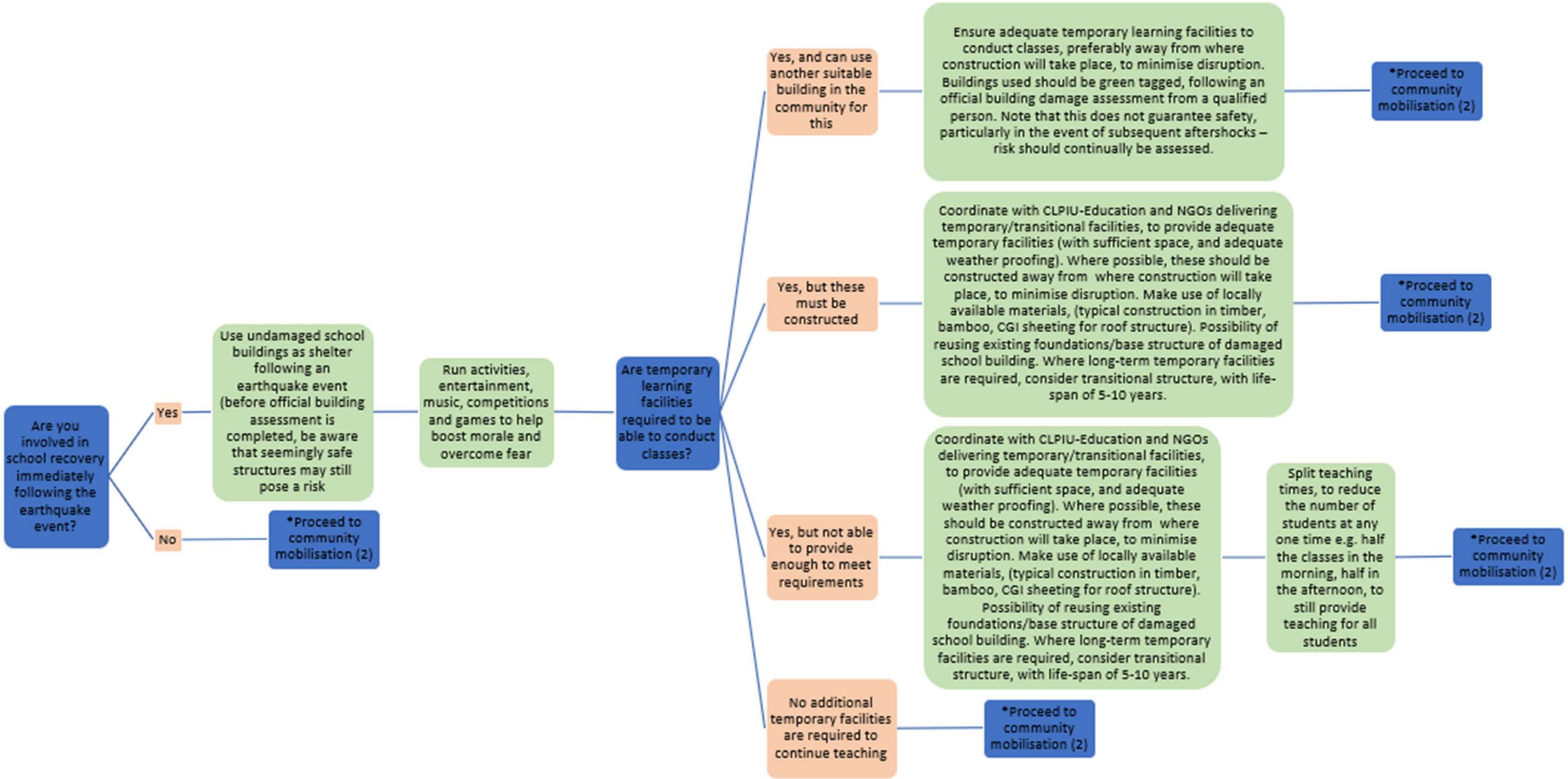


Figure I-13 – Community decision tree, part one of five. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

6. Community: Community mobilisation (2/5)

Figure I-14 – Community decision tree, part two of five. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

6. Community: Experience (3/5)

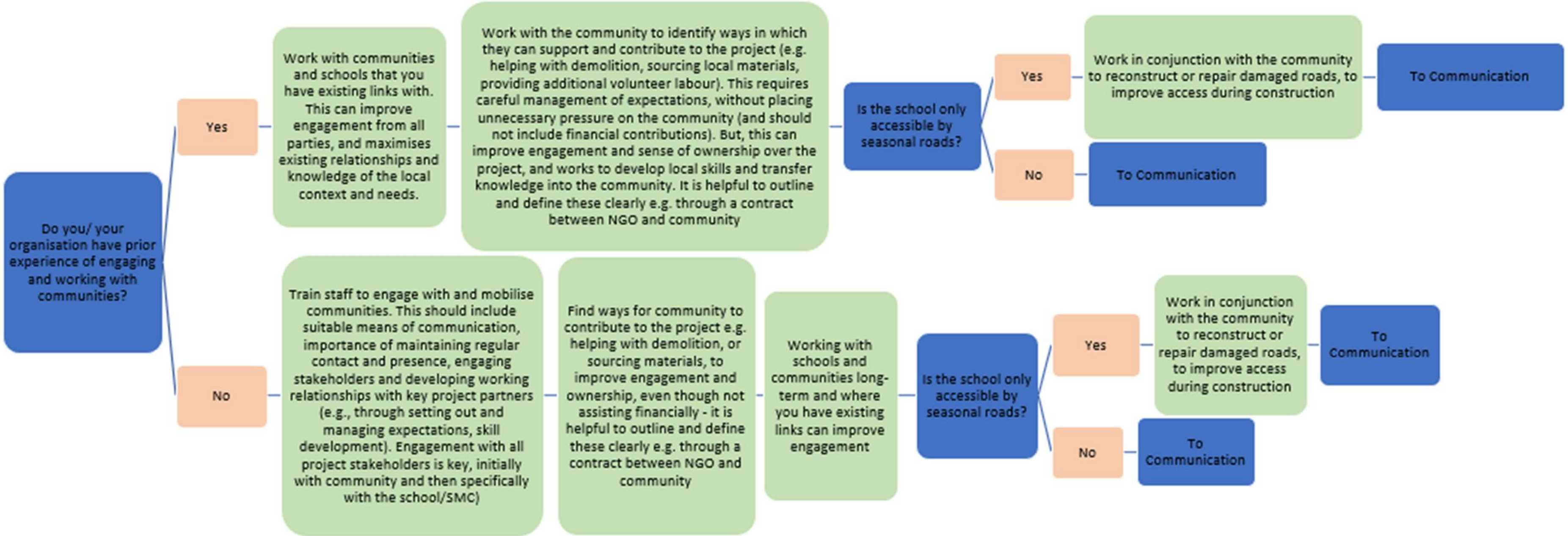


Figure I-15 – Community decision tree, part three of five. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

6. Community: Communication (4/5)

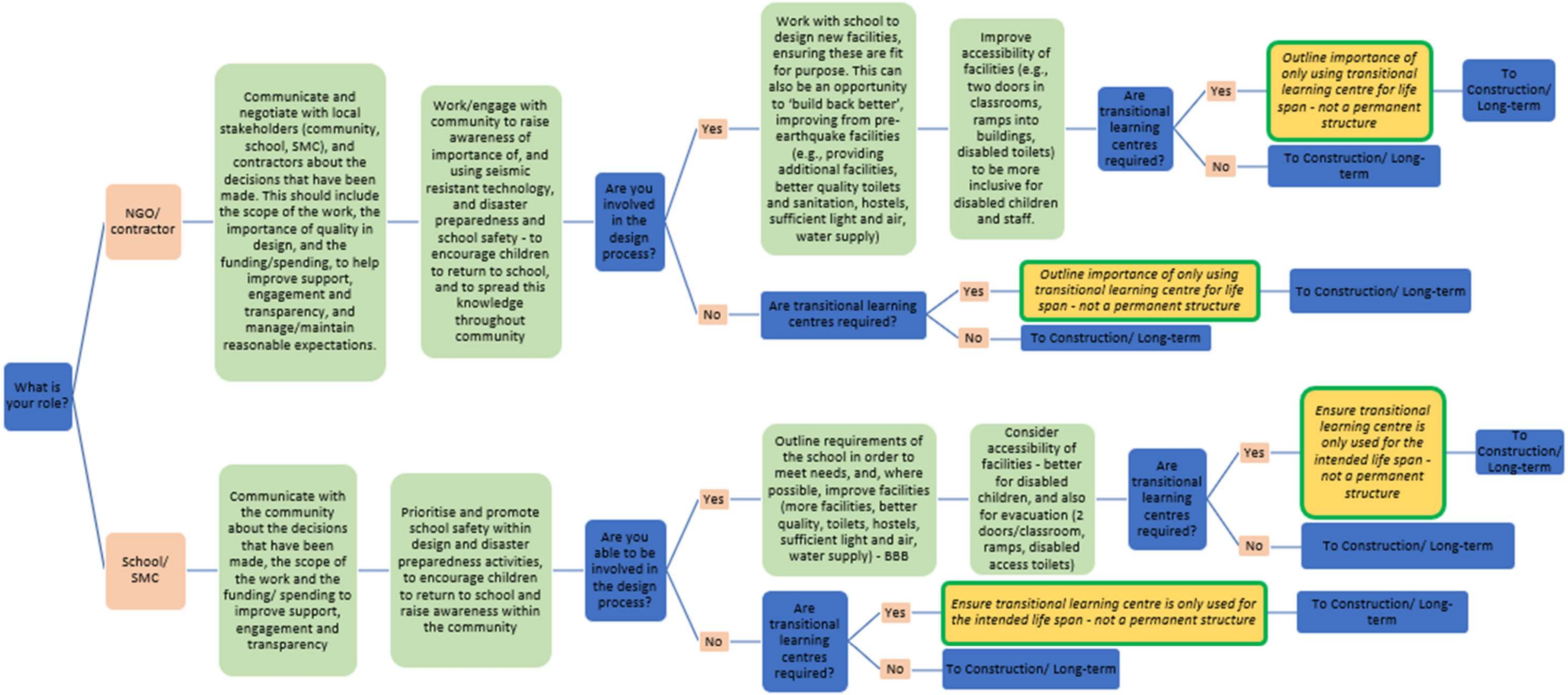


Figure I-16 – Community decision tree, part four of five. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

6. Community: Construction/long term involvement (5/5)

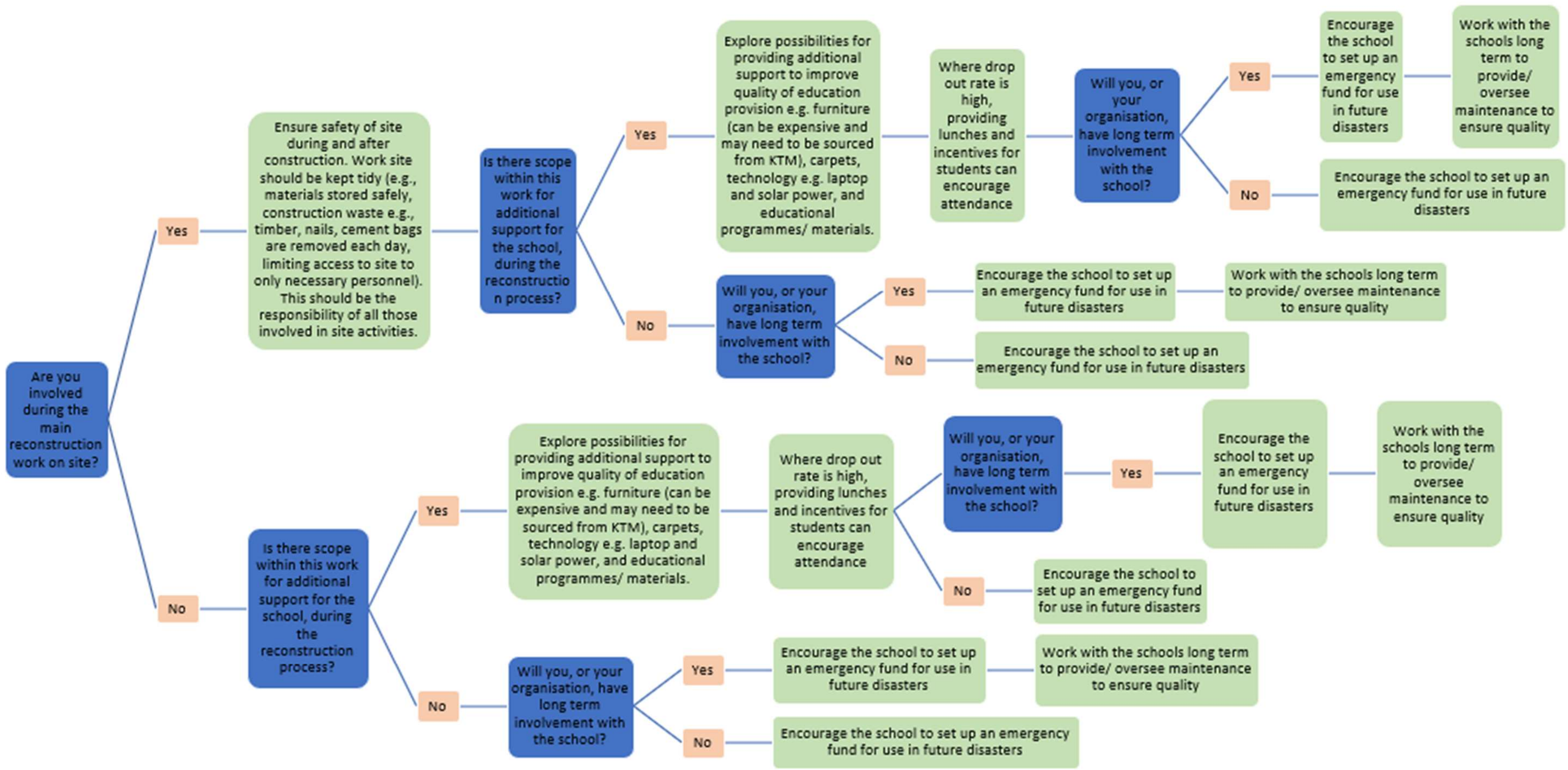


Figure I-17 – Community decision tree, part five of five. Questions (decisions) shown in blue, potential answers (context) shown in orange, good practice shown in green.

Appendix J:

Evaluation of options for combining decision trees

Appendix J. Evaluation of options for combining decision trees

Table J-1 – Evaluation of the potential options for combining the individual decision trees within the prototype tool.

Mode of combining	Functionality (users, role etc.)	Pros	Cons	Overall suitability
• Leave all as separate sections to work through individually	• Would be used to work through individual decision trees for each challenge category (i.e. accessibility and transportation, community) • Users would have to independently navigate between decision trees to view each one • Allows users to view individual trees if there is a particular aspect of importance to focus on (e.g. if this is a particularly great or unfamiliar challenge) • Users could view each decision tree separately at any point before or within a project • This could be useful for all stakeholders, to either view all trees, or just view ones of particular relevance (e.g. a school would not need to identify appropriate materials if they are not overseeing the construction)	• Easiest and quickest to compile • Could focus on one specific aspect if it was known that would be a particular challenge (i.e. accessibility) – would be most useful if you had experience e.g. navigating the government process, but would be working in a new/unfamiliar district • Easier to display • Useful to be able to more clearly see which challenges the good practice is relevant to	• Would be harder to apply across a whole project • Would leave multiple repeat questions • Wouldn't be as functional as a tool	• Could work if necessary, but not the ideal solution

• Make one large decision tree combining them all into one	• Would be used to navigate through all the likely challenges faced within a project within one decision tree/ tool • Users would be unable to view challenges individually, and would have to navigate through the whole tree to identify the relevant good practice • Would likely be of most use for the overall project manager and those coordinating the full reconstruction project • Would be less useful for those only involved in some aspects of a project	• Would produce a more comprehensive tool • Better able to work through a whole project as one	• Very time consuming to put together • Would be very hard to display as it would require a large area to be readable • Easier to make errors when compiling due to the intricacies • Potentially overwhelming for someone to look through • Hard to jump to a specific point of interest without navigating through all previous questions • Potential for larger inaccuracies in selection to occur, and options would be limited based on previous decisions – this would be less suitable if there are some unknowns within the project, at	• Although would be a suitable way to display, it is likely that the effort required to compile it would outweigh the benefits

			the point of using the tool	
• Leave mostly separate, but identify the key transfer points between the trees indicated	• Would be used to work through individual decision trees for each challenge category (i.e. accessibility and transportation, community) • The transfer points would better represent (than the fully individual trees) the full system of all decisions that must be made, by creating a natural flow throughout all decisions trees • Allows users to view individual trees if there is a particular aspect of importance to focus on (e.g. if this is a particularly great or unfamiliar challenge) • Users could view each decision tree separately at any point before or within a project • This could be useful for all stakeholders, to either view all trees, or just view ones of particular relevance (e.g. a school would not need to identify appropriate materials if they are not overseeing the construction)	• A good mixture of the two previous options • Still have the option to view as separate if desired • Easier to display when left separate • Transfer points would help users navigate through the system to still work as a functional tool • Relatively easy to compile, making small adjustments to existing decision trees • Useful to be able to more clearly see which challenges the good practice is relevant to • Could focus on one specific aspect if it was known that would be a particular challenge (i.e. accessibility) – would be most useful if you had experience e.g. navigating the	• Would not be able to show as one large system • Would provide each set of good practice separately from each tree, rather than a full list compiled from all • While it could be reduced, there would still be some repeats of specific questions	• A relatively easy option to compile, with a likely good balance between work input and reward, producing a relatively functional tool

		government process, but would be working in a new/unfamiliar district • Reduces the impact of unknowns, as these decisions would only affect good practice recommended for the individual challenge decision trees, rather than impacting on all, in a combined system.		
• Include the generic/ common questions first (i.e. role in the project, location etc.), and from there branch out into condensed individual decision trees, or could have the full system mapped as one	• This would act more as a fully combined system, and reduce the amount of repetitive questions between individual trees • This could then flow into either reduced individual trees, or a full network of all decisions • This would be used by an individual stakeholder within a project, but would narrow the field of options too quickly to make it relevant to multiple users e.g. a team of people of different roles within the project – it is likely this would be most useful for an overall	• Reduces amount of repeat questions, improving the functionality of the tool	• Would decrease the potential of individual trees following this, as removing the repeat questions would remove key decisions for each challenge • Time consuming to compile, with little extra benefit • There would be a large amount of good practice delivered in one go which could	• While this would be a good way to reduce the repletion within the tool, it would be complex to compile, and would limit the potential to view challenges individually if wanting to focus on a specific aspect

	project manager etc. although would be functional for each role individually		potentially overwhelm users	
• Chronological tree, combined from all individual trees	• This would be more applicable when applied throughout the duration of a project • This would be harder for individual stakeholders with specific roles to use, as some aspects of the decision-making process may not be relevant, but would still need to be navigated within the tool, and therefore would be better suited to use by an overall project manager/coordinator	• Would better represent the full decision-making process of going through an actual project • Would reduce the impact of unknowns within the decision tree, as decisions could be made at the relevant timing, rather than potentially forecasting future decisions before reaching that stage of the project	• Very hard/time consuming to compile • Would be hard to display as one large system • Hard to take in all the information, or jump into the relevant point if picking it up throughout the project (unless programmed to remember previous decisions (beyond scope) • Would not necessarily add much value	• This may be the optimum solution as a fully-functioning tool (dependent on validation results), but would be beyond scope of this study/work and ability to compile it effectively (and individual challenge trees generally run chronologically within one anyway)

Appendix K:

Validation questionnaire

Appendix K. Validation questionnaire

School reconstruction in Nepal - Decision-making tool validation exercise

Thank you for working the tool. Please now answer the following questions, evaluating your experience. You are not required to answer any question you do not want to, and are free to leave the study at any time.

Section 1: Project context

1. Please select the scenario numbers you were given at the end of each section of the tool: (if you did not record these, please select 'Unknown' for each)
    a. 1a. Government process:
    b. 1b. Site selection:
    c. 1c. Accessibility:
    d. 1d. Materials:
    e. 1e. Labour:
    f. 1f. Community involvement:
2. Please give details of the project you were considering:
    a. 2a. Which best describes your role within the project?
        i. School/SMC representative
        ii. NGO representative e.g. project manager, project coordinator
        iii. Engineer
        iv. Government representative
        v. Funder
        vi. Other (please specify)
    b. 2b. Briefly describe the location of the project you were considering (e.g. Village/VDC, Municipality, District)
    c. 2c. Which of these best describe the level of accessibility of the project?
        i. Easy to access
        ii. Accessible but on poor quality roads
        iii. Accessibility limited by seasonal roads
        iv. No road access available
        v. Other (please specify)
    d. 2d. Which of these best describe the mode of implementation and initiation of the project?
        i. School/School Management Committee led
        ii. NGO/donor led
        iii. Government/international agency led
        iv. Other (please specify)
    e. 2e. Which of these best describe the size of the project?
        i. Small (up to 5 classrooms)
        ii. Medium (6 to 15 classrooms)
        iii. Large (16 or more classrooms)
    f. 2f. Which of these materials were used in the main structure of the project school? Please select all that apply.
        i. Fired bricks
        ii. Reinforced concrete

iii. Stone
iv. Timber
v. Compressed stabilised earth bricks
vi. Earth bags
vii. Mud mortar
viii. Other (please specify)

g. 2g. Which of these describe the involvement of different classes of labour within the project? Please select all that apply.
   i. Professional contractors
   ii. Skilled labourers from outside the community
   iii. Local skilled labourers
   iv. Local unskilled labourers
   v. Local volunteers
   vi. Other (please specify)

3. 3a. Which of these best describe how closely you were able to match the true context of the project within the tool?
   a. No similarity to the project
   b. Small similarities but generally did not match
   c. Some key aspects matched, but not others
   d. Mostly matched, but some small differences
   e. Fully matched the project
4. Please detail any changes you would make to the tool, to improve how you can identify the appropriate context for a specific project

Section 2: Good practice

5. Which of these best describe how much of the good practice recommended, if any, was actually used within the project considered?
   a. None of the good practice recommended was used
   b. Some of the good practice recommended was used
   c. Most of the good practice recommended was used
   d. All of the good practice recommended was used
   e. The tool was missing key good practice that was actually used in the project
6. Which of these options best describe how suitable, if at all, the good practice recommended within the tool would be for the project you were considering, even if they were not used within the project?
   a. None of the good practice recommended would have been suitable
   b. Very little of the good practice recommended would have been suitable
   c. Some of the good practice recommended would have been suitable
   d. Most of the good practice recommended would have been suitable
   e. All of the good practice recommended would have been suitable
7. Please detail any changes you would make to the tool, to improve the good practice identified for a specific project:

Section 3: Value and impact of the tool

8. Which of these options best describe how helpful, if at all, this tool would be, if implemented within school reconstruction project(s) you are involved in? Please outline the reasons for your choice in the box below:
   a. This tool would not be helpful at all within a school reconstruction project

    b. The tool would be helpful, but not enough to make it worth using it
    c. This tool would not be helpful for me, but could be for less experienced stakeholders
    d. This tool would be quite helpful within a school reconstruction project, and would be something I would use
    e. This tool would be very helpful within a school reconstruction project, and would be something I would use

9. Which, if any, would be a potential benefit of implementing this tool? Please select all that apply:
    a. Better managing/planning the project
    b. Decreasing costs
    c. Better managing budgets
    d. Reducing delays
    e. Reducing timeframe/duration of construction
    f. Increasing quality of construction
    g. Providing additional benefits to school/community
    h. None of the above
    i. Other (please specify)
10. Please detail any changes you would make to the tool, to improve the value and impact of implementing it within a specific project:

Section 4: Functionality of the tool

11. Overall, how easy/hard was it to navigate and use the tool? Please give your reasons why in the box below:
    a. Very hard
    b. Moderately hard
    c. Neither easy nor hard
    d. Moderately easy
    e. Very easy
12. Was the tool a suitable and appropriate length?
    a. Much too long
    b. Moderately too long
    c. Neither too long nor too short
    d. Moderately too short
    e. Much too short
13. Please detail any changes you would make to the tool, to improve the functionality of the tool, if using it within a specific project:

End of questionnaire: please leave your email address - this is only to track who has responded, and will be removed from the data before any analysis is conducted.

Data Protection Statement

This research is being conducted as part of PhD research conducted at Newcastle University, UK. All data and responses collected will be confidential and stored securely on university computer systems, only shared with the primary researcher and supervisors. Where data and responses will be used within publishable work, all responses will be kept anonymous. Any participant in this research is free to leave the study at any time, and is not required to answer any question they do not know or do not feel comfortable answering.

Appendix L:

Validation exercise results

Appendix L. Validation exercise results

Table L-1 – Data from the validation exercise questionnaire.

Entry #	15	14	13	12	11	10	9	8	7
Date Created	2020-12-04 07:54:01	2020-12-03 10:49:32	2020-12-03 10:04:25	2020-12-03 09:21:35	2020-12-02 06:08:01	2020-11-24 22:56:49	2020-11-20 20:02:11	2020-11-20 07:09:17	2020-11-19 20:52:48
Date Updated									
1. Please select the scenario numbers you were given at the end of each section of the tool: (if you did not record these, please select 'Unknown' for each) 1a. Government process:	Unknown	Scenario G38	Unknown	Scenario G2	Unknown		Scenario G47	Unknown	Unknown
1b. Site selection:	Unknown	Scenario S7	Unknown	Scenario S6	Unknown		Scenario S12	Unknown	Scenario S10
1c. Accessibility:	Unknown	Scenario A5	Unknown	Scenario A4	Unknown		Scenario A6	Unknown	Unknown
1d. Materials:	Unknown	Scenario M27	Unknown	Scenario M5	Unknown		Scenario M18	Unknown	Unknown
1e. Labour:	Unknown	Scenario L1	Unknown	Scenario L6	Unknown		Scenario L5	Unknown	Unknown
1f. Community involvement:	Unknown	Scenario C210	Unknown	Unknown	Unknown		Scenario C141	Unknown	Unknown
2. Please give details of the project you were considering:	NGO representative e.g. project manager, project coordinator	NGO representative e.g. project manager, project coordinator	Engineer	NGO representative e.g. project manager, project coordinator	NGO representative e.g. project manager, project coordinator	NGO representative e.g. project manager, project coordinator	Engineer	Government representative	Funder

2a. Which best describes your role within the project?									
2b. Briefly describe the location of the project you were considering (e.g. Village/VDC, Municipality, District)	[Location]	[Location]	[Location]	[Location]	[Location]	[Location]	[Location]	[Location]	[Location]
2c. Which of these best describe the level of accessibility of the project?	Accessibility limited by seasonal roads	Accessibility limited by seasonal roads	Accessibility limited by seasonal roads	Accessibility limited by seasonal roads	Accessibility limited by seasonal roads	No road access available	Accessible but on poor quality roads	Accessibility limited by seasonal roads	Accessible but on poor quality roads
2d. Which of these best describe the mode of implementation and initiation of the project?	School/School Management Committee led	NGO/donor led	NGO/donor led	NGO/donor led	School/School Management Committee led	NGO/donor led	School/School Management Committee led	Government/international agency led	School/School Management Committee led
2e. Which of these best describe the size of the project?	Medium (6 to 15 classrooms)	Medium (6 to 15 classrooms)	Small (up to 5 classrooms)	Small (up to 5 classrooms)	Small (up to 5 classrooms)	Small (up to 5 classrooms)	Medium (6 to 15 classrooms)	Medium (6 to 15 classrooms)	Medium (6 to 15 classrooms)
Fired bricks		Fired bricks	Fired bricks				Fired bricks	Fired bricks	Fired bricks
Reinforced concrete	Reinforced concrete	Reinforced concrete	Reinforced concrete					Reinforced concrete	Reinforced concrete
Stone	Stone		Stone		Stone			Stone	
Timber	Timber								
Compressed stabilised earth bricks				Compressed stabilised earth bricks	Compressed stabilised earth bricks				

Earth bags						Earth bags			
Mud mortar									
Other (please specify)								Metallic door and windows	
Professional contractors	Professional contractors	Professional contractors	Professional contractors	Professional contractors				Professional contractors	Professional contractors
Skilled labourers from outside the community		Skilled labourers from outside the community	Skilled labourers from outside the community		Skilled labourers from outside the community		Skilled labourers from outside the community		
Local skilled labourers	Local skilled labourers	Local skilled labourers	Local skilled labourers	Local skilled labourers			Local skilled labourers		Local skilled labourers
Local unskilled labourers		Local unskilled labourers	Local unskilled labourers	Local unskilled labourers		Local unskilled labourers	Local unskilled labourers		Local unskilled labourers
Local volunteers	Local volunteers	Local volunteers			Local volunteers		Local volunteers		
Other (please specify)									
3a. Which of these best describe how closely you were able to match the true context of the project within the tool?	Mostly matched, but some small differences	Mostly matched, but some small differences	Some key aspects matched, but not others	Some key aspects matched, but not others	Small similarities but generally did not match	No similarity to the project	Some key aspects matched, but not others	Mostly matched, but some small differences	Mostly matched, but some small differences
4. Please detail any changes you would make to the tool, to improve how you can identify the appropriate context for a specific project				Each project aspect is different with different workability of local govt standards so ideal cases dont always apply	Too lengthy, simplification needed	Rather lengthy to follow and didnt note down numbers. Not sure what you are trying to achieve.			

5. Which of these best describe how much of the good practice recommended, if any, was actually used within the project considered?	Most of the good practice recommended was used	All of the good practice recommended was used	All of the good practice recommended was used	Most of the good practice recommended was used	Some of the good practice recommended was used		Most of the good practice recommended was used	Most of the good practice recommended was used	Most of the good practice recommended was used
6. Which of these options best describe how suitable, if at all, the good practice recommended within the tool would be for the project you were considering, even if they were not used within the project?	Most of the good practice recommended would have been suitable	Most of the good practice recommended would have been suitable	All of the good practice recommended would have been suitable	Very little of the good practice recommended would have been suitable	Some of the good practice recommended would have been suitable		Some of the good practice recommended would have been suitable	Most of the good practice recommended would have been suitable	Most of the good practice recommended would have been suitable
7. Please detail any changes you would make to the tool, to improve the good practice identified for a specific project:						Not useful for us i am afraid			
8. Which of these options best describe how helpful, if at all, this tool would be, if	This tool would be quite helpful within a school reconstruction project, and	This tool would be quite helpful within a school reconstruction project, and	This tool would be very helpful within a school reconstruction project, and	This tool would not be helpful for me, but could be for less	This tool would not be helpful for me, but could be for less	This tool would not be helpful at all within a school	This tool would be quite helpful within a school reconstruction project, and	This tool would be quite helpful within a school reconstruction project, and would	This tool would be quite helpful within a school reconstruction project, and

implemented within school reconstruction project(s) you are involved in? Please outline the reasons for your choice in the box below:	would be something I would use	would be something I would use	would be something I would use	experienced stakeholders	experienced stakeholders	reconstruction project	would be something I would use	be something I would use	would be something I would use
Better managing/planning the project	Better managing/planning the project	Better managing/planning the project	Better managing/planning the project	Better managing/planning the project	Better managing/planning the project		Better managing/planning the project	Better managing/planning the project	
Decreasing costs			Decreasing costs					Decreasing costs	
Better managing budgets	Better managing budgets		Better managing budgets					Better managing budgets	
Reducing delays	Reducing delays	Reducing delays	Reducing delays		Reducing delays			Reducing delays	
Reducing timeframe/duration of construction			Reducing timeframe/duration of construction					Reducing timeframe/duration of construction	
Increasing quality of construction			Increasing quality of construction	Increasing quality of construction	Increasing quality of construction		Increasing quality of construction	Increasing quality of construction	
Providing additional benefits to school/community		Providing additional benefits to school/community	Providing additional benefits to school/community	Providing additional benefits to school/community			Providing additional benefits to school/community	Providing additional benefits to school/community	Providing additional benefits to school/community
None of the above						None of the above			
Other (please specify)									
10. Please detail any changes you would make to									

the tool, to improve the value and impact of implementing it within a specific project:									
11. Overall, how easy/hard was it to navigate and use the tool? Please give your reasons why in the box below:	Moderately easy	Moderately easy	Moderately easy	Neither easy nor hard	Moderately hard	Neither easy nor hard	Moderately hard	Moderately easy	Very easy
12. Was the tool a suitable and appropriate length?	Neither too long nor too short	Moderately too long	Neither too long nor too short	Neither too long nor too short	Much too long	Much too long	Moderately too long	Neither too long nor too short	Moderately too long
13. Please detail any changes you would make to the tool, to improve the functionality of the tool, if using it within a specific project:							remove the looping back to the same once option is selected. There were several instance of repeating and sometimes getting hard to exit		