

**UNDERSTANDING CHOICE BEHAVIOUR
TO ADVANCE SUSTAINABLE DEVELOPMENT
IN HOUSING PRODUCTION**

by

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Abstract

Sustainable development requires us to change our construction technologies in order to avoid negative environmental and economic impacts. However, evidence shows that stakeholders in the field are still choosing housing construction materials and methods that do not advance sustainable development. This problem has been attributed to their underlying choice determinants. Therefore, this thesis investigates the inherent values and choice processes that determine the choice decisions of housing user and housing practitioners, as well as the relationship between these choice determinants and the requirements of sustainable development.

The empirical investigation is an exploratory behavioural study in the social sciences and uses a qualitative research strategy. A case study investigation is conducted in Uyo, Nigeria, as a context that is instrumental to understanding the inherent choice behaviour of stakeholders in the field when faced with a choice of housing construction technologies. Choice decision theories provide the analytical framework.

The outcomes of the empirical research are:

- An emerging theory of stakeholders' choice behaviour, identifying the values and describing the processes that determine their choice of housing construction materials and method; and
- A propositional model of the relationship between the egoistic, preference-based requirements of housing users; the deontological, performance-based requirements of housing practitioners; and the wider welfare requirements of sustainable development. From this model, the study predicts how these stakeholders themselves would choose change, and thereby advance sustainable development, without the need to alter their normal choice values and processes.

This new knowledge contributes to choice behaviour theory. The findings also inform needed alterations to sustainable development policy, innovation and impact assessment. Further research is prescribed to test the propositions, conclusions and recommendations made here. The study also supports the call for further research into behavioural areas in the field of housing production that are crucial to sustainable development.

Dedication

This work is dedicated to everyone
whose voice I represent.

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Table of Contents

Abstract	ii
Dedication	iii
Acknowledgements	iv
Table of Contents	v
List of Tables.....	xi
List of Figures	xii
Chapter 1 Introduction: Change and Choice.....	1
1.1 Background	1
1.2 Formulating the Research Problem	3
1.3 Research Questions and Research Logic	11
1.4 The Theoretical Framework of the Study	13
1.5 Investigating the Research Problem	16
1.6 Chapter Summation.....	17
Chapter 2 Sustainable Development and Housing Construction	
- A Literature Review	18
2.1 Introduction to the Literature Review	18
2.2 Sustainable Development.....	18
2.2.1 <i>Defining sustainable development</i>	19
2.2.2 <i>Sustainability is not sustainable development</i>	31
2.3 Sustainable Development and Housing Production	37
2.3.1 <i>What housing construction materials and methods mean for sustainable development</i>	40

2.3.2	<i>What sustainable development means for housing construction materials and methods</i>	42
2.3.3	<i>Steerage towards sustainable development through institutional action</i>	48
2.3.4	<i>Technological innovation for sustainable development:</i>	52
2.3.5	<i>Assessing sustainable development impacts</i>	55
2.4	Stakeholders in the Field of Housing Production.....	61
2.5	Chapter Summation.....	76
Chapter 3	Choice Behaviour Theories: Choice Theory, Evaluation Theory and Value Theory	78
3.1	Introduction to Choice Behaviour Theories.....	78
3.2	Choice Theory	78
3.3	Evaluation Theory	91
3.4	Value Theory.....	96
3.5	Chapter Summation.....	105
Chapter 4	Uyo, Nigeria – The Study Area	107
4.1	Introduction	107
4.2	Nigeria – Geo-political and socio-economic features.....	108
4.3	Nigeria – Housing production.....	113
4.3.1	<i>A historical review of housing production in Nigeria</i>	113
4.3.2	<i>Housing production in Uyo</i>	120
4.4	Chapter Summation.....	123
Chapter 5	The Research Methodology	125
5.1	Introduction to the Research Methodology	125
5.2	Qualitative Research Strategy	125
5.3	Case Study Research Design.....	129

5.3.1	<i>The theoretical framework in relation to the data</i>	131
5.3.2	<i>The research participants – Purposive sampling</i>	133
5.3.3	<i>The research method – Interviews</i>	136
5.4	Data Collection	137
5.5	The Analysis of the Data.....	141
5.6	Ethical Considerations.....	142
5.7	Chapter Summation.....	143

Chapter 6 Data Analysis and Discussion for Stakeholder Level I:

	HOUSING USERS	144
6.1	Introduction to the housing users' data analysis	144
6.2	Thematic Analysis and Findings.....	145
6.2.1	<i>Theme 1: Considerations that go into choice of housing construction materials and methods</i>	147
6.2.2	<i>Theme 2: The place of sustainable development in choice of housing construction materials and methods</i>	149
6.2.3	<i>Theme 3: Whose duty it is to act in advancing sustainable development</i>	151
6.2.4	<i>Theme 4: Support for new legislation on sustainable development in housing production</i>	153
6.2.6	<i>Summary of the findings from the thematic analysis</i>	155
6.3	Coding Analysis and Findings.....	156
6.3.1	<i>Multiple Rationales</i>	156
6.3.2	<i>Social determinacy of choice</i>	157
6.3.3	<i>The u, v procedure</i>	158
6.3.4	<i>Ambiguity of preferences</i>	159
6.3.5	<i>Status quo bias</i>	160
6.3.6	<i>Dynamic aspiration levels</i>	161
6.3.7	<i>Imitation</i>	162

6.3.8	<i>Melioration</i>	163
6.3.9	<i>Epistemic value of the menu</i>	164
6.3.10	<i>Summary of the findings from the coding analysis</i>	164
6.4	Theorising Housing Users' Choice Behaviour	165
6.5	Housing Users and Sustainable Development.....	168
6.5.1	<i>Sustainable development welfare requirements and housing users' preference requirements</i>	168
6.5.2.	<i>Sustainable development steerage and housing users</i>	172
6.5.3	<i>Sustainable development innovation and housing users</i>	173
6.5.4	<i>Sustainable development action and housing users</i>	174
6.6	Chapter Summation.....	175

Chapter 7 Data Analysis and Discussion for Stakeholder Level II:

	HOUSING PRACTITIONERS	177
7.1	Introduction to the housing practitioners' data analysis	177
7.2	Questionnaire Data Analysis and Findings.....	178
7.2.1	<i>Level of Importance of Sustainable Development Issues</i>	178
7.2.2	<i>Primary Duty</i>	185
7.2.3	<i>Influencing Factors</i>	194
7.2.4	<i>Consideration of Sustainable Development Issues</i>	199
7.2.5	<i>Live examples</i>	203
7.2.6	<i>Summary of the questionnaire data findings</i>	204
7.3	Group Discussion Interview Data Analysis and Findings	205
7.3.1	<i>Thematic Analysis</i>	205
7.3.2	<i>Summary of findings from the thematic analysis of the group discussion data</i>	210
7.3.3	<i>Coding Analysis</i>	210
7.3.4	<i>Summary of findings from the coding analysis</i>	216
7.4	Theorising Housing Practitioners' Choice Behaviour	216

7.5	Housing Practitioners and Housing Users	218
7.6	Housing Practitioners and Sustainable Development.....	220
7.6.1	<i>Housing practitioners' values and sustainable development values</i>	220
7.6.2	<i>Ability, housing practitioners and sustainable development..</i>	223
7.7	Chapter Summation.....	225
Chapter 8	Advancing Sustainable Development.....	227
8.1	Introduction to the chapter	227
8.2	Working Together For Sustainable Development.....	228
8.3	Specifying Normative Value Statements.....	232
8.3.1	<i>The Universal Sustainable Development Value</i>	232
8.3.2	<i>Specifying the ability-relative value</i>	233
8.3.3	<i>Specifying the agent-relative value</i>	234
8.4	Choice Engineering for Sustainable Development	235
8.4.1	<i>Choice engineering strategies suitable for housing users</i>	236
8.4.2	<i>Choice engineering strategies suitable for housing practitioners</i>	240
8.5	Chapter Conclusion	242
Chapter 9	Conclusion: Choosing Change	245
9.1	The Research Problem	245
9.2	The Empirical Research.....	246
9.2.1	<i>Housing Users</i>	247
9.2.2	<i>Housing Practitioners</i>	247
9.3	Review of the Findings.....	248
9.3.1	<i>Housing users' choice behaviour explained</i>	248
9.3.2	<i>Housing practitioners' choice behaviour explained</i>	250

9.3.3	<i>Stakeholders' choice mechanisms and sustainable development</i>	250
9.4	Sustainable Development Value Statements	254
9.4.1	<i>Incorporating protection into sustainable development steerage</i>	254
9.4.2	<i>Incorporating stakeholders' requirements into sustainable development innovation</i>	255
9.4.3	<i>Providing a reason to act to choose change</i>	256
9.5	Improving choice decisions	257
9.6	Original Contributions to Knowledge.....	260
9.7	Limitations of the Study	262
9.8	Suggestions for Further Research	263
9.8	Final Summation	265
	Appendix A Field Instruments	267
	Appendix B Thematic Analysis of Group Discussion Data: HOUSING USERS	274
	Appendix C Coding Frame for Questionnaire Data: HOUSING PRACTITIONERS	278
	Appendix D Thematic Analysis of Group Discussion Data: HOUSING PRACTITIONERS	284
	Appendix E Letter of Appreciation to Research Participants	286
	REFERENCES	287

List of Tables

Table 1: <i>A critical analysis of sustainable development as it is presented in The Brundtland Report</i>	29
Table 2: <i>What sustainable development means for housing production</i>	47
Table 3: <i>House types in Nigeria (from the literature)</i>	120
Table 4: <i>Systematic sampling based on employment categories</i>	134
Table 5: <i>Modal statistics for 'Importance of sustainable development issues'</i>	180
Table 6: <i>Modal statistics for 'Primary duty'</i>	185
Table 7: <i>Frequencies for 'Primary duty'</i>	185
Table 8: <i>Modal statistics for 'Form of duty'</i>	187
Table 9: <i>Frequencies for 'Form of duty'</i>	188
Table 10: <i>Modal statistics for 'Value orientation'</i>	192
Table 11: <i>Frequencies for 'Value orientation'</i>	193
Table 12: <i>Modal statistics for 'Level of influence'</i>	194
Table 13: <i>Modal statistics for 'Overall level of influence'</i>	198
Table 14: <i>Modal statistics for 'Consideration of sustainable development issues'</i>	200
Table 15: <i>Framework analysis of the civil servants' discussion data</i>	275
Table 16: <i>Framework analysis of the market traders' discussion data</i>	276
Table 17: <i>Framework analysis of the business owners' discussion data</i>	277
Table 18: <i>Coding 'Importance of sustainable development issues'</i>	279
Table 19: <i>Coding 'Importance of domains'</i>	279
Table 20: <i>Coding 'Form of duty'</i>	281
Table 21: <i>Coding 'Value orientation'</i>	281
Table 22: <i>Coding 'Overall level of influence'</i>	282
Table 23: <i>Framework analysis of the architects' group discussion data</i>	285

List of Figures

Figure 1: <i>Conceptual framework – Sustainable development, housing construction materials and methods and choice behaviour</i>	2
Figure 2: <i>Possible forms of the relationship between choice and change</i>	10
Figure 3: <i>Theoretical Framework: Choice Theory, Evaluation Theory and Value Theory</i>	15
Figure 4: <i>Pre-sustainable development - Development versus sustainability</i>	24
Figure 5: <i>Sustainable development - development together with sustainability</i>	25
Figure 6: <i>A simplified lifecycle process flow chart showing the production stage</i>	38
Figure 7: <i>Linear VBN behaviour model developed by Stern et al. (1999)</i>	68
Figure 8: <i>Change and Choice in Housing Production</i>	75
Figure 9: <i>Feasible choice set, developed from Plott (1976)</i>	81
Figure 10: <i>Map of Nigeria showing location of Uyo</i>	108
Figure 11: <i>Nigeria - vegetation</i>	109
Figure 12: <i>Nigeria - Topography</i>	110
Figure 13: <i>World - Human development index values</i>	111
Figure 14: <i>Nigeria - Ethnic groups (1)</i>	117
Figure 15: <i>Nigeria - Ethnic groups (2)</i>	117
Figure 16: <i>Example of a contemporary house type</i>	121
Figure 17: <i>Example of a vernacular house type</i>	122
Figure 18: <i>Logical links from general theory to research findings</i>	132
Figure 19: <i>u, v procedure in housing users' choice behaviour</i>	171
Figure 20: <i>Frequencies for 'Importance of sustainable development issues'</i>	181
Figure 21: <i>Importance of environmental and economic domains for each respondent</i>	184
Figure 22: <i>Frequency chart for 'Level of influence'</i>	196
Figure 23: <i>Frequencies for 'Overall level of influence'</i>	198
Figure 24: <i>Frequencies for 'Consideration of sustainable development issues'</i>	200
Figure 25: <i>Feasible choice set in housing practitioners' choice behaviour</i>	223
Figure 26: <i>Propositional model for choice and change in housing production</i>	229
Figure 27: <i>The propositional model for 'Choosing Change'</i>	252

Chapter 1

Introduction: Change and Choice

1.1 Background

This PhD thesis is the report of a research study I have conducted that is aimed at understanding the underlying mechanisms that determine the behaviour of stakeholders in the field of housing production when they are faced with a choice of the materials and methods to use for housing construction. I have undertaken this behavioural study with particular reference to sustainable development and the ways in which sustainable development and stakeholder choice behaviour in the field are related. The thesis of this doctoral dissertation is that an understanding of the underlying values and processes that determine choice is essential for explaining the materials and methods that stakeholders in the field of housing construction choose to use to build houses. This knowledge is also crucial for advancing sustainable development in this field.

This study links together three main multifaceted concepts:

- sustainable development;
- housing construction materials and methods (also referred to in this study as housing construction technologies); and
- stakeholder choice behaviour.

Figure 1 below is a graphic representation of the conceptual framework showing the links between the different concepts that are central to this study.

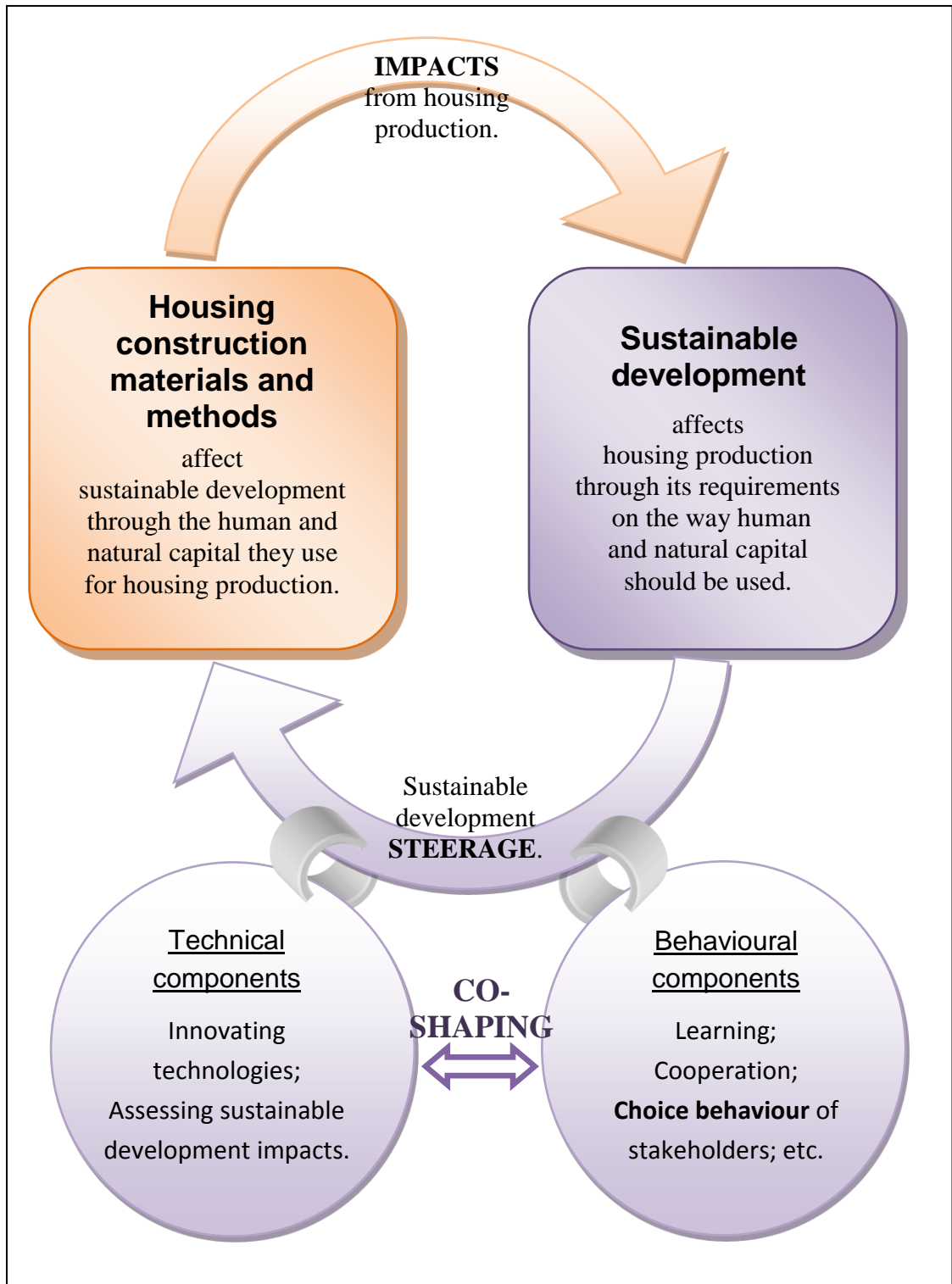


Figure 1: *Conceptual framework – Sustainable development, housing construction materials and methods and choice behaviour*

My research is conducted in the field of housing production. As an architect who has practised in this field, I observed first-hand the problems associated with the way I had been trained to build – using cement, glass and metal. The literature also defines these problems and clearly indicates a basis for change. Furthermore, the literature highlights some of the behavioural barriers to this urgently required change. A critical review of the literature on sustainable development, housing production and choice behaviour points to a need to understand choice behaviour in the field of housing production and how it affects the advancement of sustainable development in this field.

1.2 Formulating the Research Problem

The literature review is provided in chapter 2. In it I show that sustainable development is a clear and well defined concept and that the concept of sustainable development has become operational in the field of housing construction. Crucially, I review the literature on behavioural studies in the field of housing construction with particular reference to sustainable development and its advancement. My review identifies a gap in knowledge about the underlying choice mechanisms that determine stakeholders' choice behaviour in this field, especially as they relate to the efforts to advance sustainable development.

My literature review shows that discursive, definitional and analytical approaches to clarifying the concept of sustainable development reveal it to be a theoretical concept that makes direct causal links between the way we use human and natural capital for our activities and the impacts these activities therefore have on the local economy and the global environment. Sustainable development is a call for change in response to conditions of widespread poverty and ecological degradation resulting directly from the way we use human and natural capital (WCED, 1987; Mebratu, 1998; Dresner, 2002). These conditions, in turn, detract from people's welfare; poverty makes it difficult for people in the present generation to achieve a good quality of life while environmental degradation will make it difficult for people in future generations to achieve a good quality of life (WCED, 1987).

I note in my review of the literature that beyond pointing out theoretically valid links between people's welfare and the way we undertake our activities: sustainable development also takes the normative stand of seeking to safeguard human welfare by directing our actions. It requires us to change the way we carry out our activities to ensure that they do not impact negatively on the economy and the environment. The seminal 1987 report of the World Commission on Environment and Development (WCED), also known as The Brundtland Report, clearly outlines the two ethical principles on which this normative stand is based. These are the principles of intergenerational equity and intragenerational equity (WCED, 1987):

- The principle of intergenerational equity requires that we do not undertake our activities in ways that make it difficult for people in future generations to achieve a good quality of life. This requires care in the way natural capital is used in the course of activities so as to support the goal of environmental sustainability.
- The principle of intragenerational equity requires that we do not undertake our activities in ways that make it difficult for people in this generation to achieve a good quality of life. This requires care in the way human capital is used in the course of carrying out activities so as to support the goal of economic development.

Thus sustainable development operates in both the economic and the environmental domains (Halliday, 2008; George, 1999; Marcuse, 1998). I show in this thesis, however, that there is an overriding focus on the environmental domain of sustainable development in the existing literature on housing construction, through a 'sustainability' discourse that leaves the requirement of economic development largely silent. The intergenerational equity principle is cited as the ethical principle guiding this sustainability goal. I show in my literature review that this sustainability discourse is at odds with sustainable development. The distinction between 'sustainability' and 'sustainable development', and its implications, runs throughout the study. Several times throughout the course of this thesis I humbly make bold to raise a range of arguments against the notion that sustainability is the focus of sustainable development:

1. The Brundtland Report points out that where human welfare is the concern, it is only logical to be as determined to safeguard the welfare of people living today as we are determined to safeguard the welfare of those who will live in the future (WCED, 1987).

2. The same document points out that poor people harm the environment for reasons of survival. It is therefore impossible to effectively protect the environment without uplifting people's economic circumstances (WCED, 1987).
3. A number of authors hold that the strength of sustainable development as a concept is that it merges the two previously opposed agendas of environmental sustainability and economic development into a single agenda concerned with safeguarding human welfare (Grainger, 2004; Dresner, 2002; Meadowcroft, 2000; Steele, 1997).
4. A political morality describes a normative idea (such as 'do not kill') that should be universally honoured and even supported by legislation. Kymlicka (1998) and Sen (2003) hold that for a normative concept to qualify as a political morality, it must protect all persons from harm equally. The intergenerational equity principle that the sustainability discourse references only seeks to protect the welfare of future generations.
5. The empirical findings from this study show no overriding focus on either environmental or economic issues among stakeholders who have agency in the field of housing construction. Economic impacts and environmental impacts from buildings were both considered very important among this group.
6. The findings from this study also indicate that housing users, by virtue of their egoistic value orientation, are better able to relate to the concept of sustainable development which protects the welfare of all than to 'sustainability', which can only secure the good of future generations – a segment of society to which they can never belong.

At all levels in the study – logical, practical, conceptual, ethical and empirical – these arguments consistently show that the goal of sustainability and the principle of intergenerational equity are not adequate to represent the concept of sustainable development. While it is true that the environment is of critical importance to sustainable development, it does not follow that the environment is its central focus. Economic development and environmental sustainability are the two twin goals of sustainable development. This thesis maintains, along with The Brundtland Report of 1987, George (1999), Meadowcroft (2000), Halliday (2008) and many others, that the economic domain is as important as the environmental domain.

Sustainable development = Economic development + Environmental sustainability

This is the clear, concise and operable conceptualisation of sustainable development that the literature provides me with for use in my research. This thesis therefore investigates the case of study within a sustainable development agenda comprising the twin goals of economic development and environmental sustainability.

To make points that refer to sustainable development, I review several studies in which sustainability or environmental sustainability is presented as the goal of sustainable development; at the same time, I remain consistent in my conceptualisation of sustainable development as having two goals – economic development and environmental sustainability. Since I have shown that environmental sustainability is a crucial part of sustainable development, these studies are therefore still important and cogent to my discussion, even though I do not agree with their conceptualisation of sustainable development.

I establish from the literature the ways in which the twin goals of economic development and environmental sustainability are operational in the field of housing construction. My review reveals that we are now aware of the significant negative impacts that housing construction has on the environment and the economy (Elizabeth and Cassandra, 2005; Zimmerman *et al.*, 2005; Griffiths *et al.*, 2003; Edwards, 2002). In my literature review in chapter 2, I discuss several studies showing that a great deal of action has been undertaken with the aim of advancing sustainable development in the field of housing construction in the technical aspects of:

- Steerage towards sustainable development in the field of housing construction by government authorities and interest groups through policy and legislation (Choguill (2007); Priemus (2005); Lee and Yik (2004); Pett (2004); Macoloo (1994) among many others).
- Technological innovation aimed at providing housing construction technology options that advance sustainable development in the field (Kuroshi, 2007; Roaf *et al.*, 2007; Mehta and Bridwell, 2005 among many others).
- The appraisal of housing construction technology options through the development of sustainable development impact assessment tools in order to inform choice of technologies that advance sustainable development in the field (Pulselli *et al.*, 2007; Bunz *et al.*, 2006; Bartlett and Guthrie, 2005; Cole, 2005 among many others).

Thus, sustainable development provides theoretically valid mechanisms for change in the way houses are built.

These change mechanisms are sustainable development steering based on wider welfare values and equity principles; and the technical processes of innovation and impact assessment. In spite of these clear and urgent requirements for change, the review provides ample evidence from the literature that show that up until this time, housing construction still contributes massively to environmental degradation and poverty creation as a result of the negative impacts from the materials and methods that are used for housing construction, both in developing regions where poverty and environmental damage are prevalent (Tiwari, 2004; Zhu and Lin, 2004) and even in more advanced economies, including those where sustainable development regimes have been in place for some time (Rid and Profeta, 2011; Crabtree and Hes, 2009; Halliday, 2008; Brown and Bhatti, 2003). These and other studies show that changes so far to the materials and methods used for housing construction have been incremental rather than widespread, even where there have been advancements in the technical aspects of sustainable development as it applies to housing production.

My literature review in chapter 2 crucially highlights a growing awareness that knowledge of these technical aspects of the sustainable development effort in housing construction is not adequate to advance sustainable development in the field. The technical components have accompanying and interacting behavioural aspects, such as learning, cooperation and choice behaviour, and these behavioural aspects also need to be adequately understood (Paredis, 2011; Jørgensen *et al.*, 2009; Guy and Shove, 2000; Koebel, 1999; Sachs, 1999). Stern (2000) makes the distinction between impact-oriented research, which aims to understand the technical aspects of how our action affect sustainable development; and intent-oriented research, which looks at the behaviour of stakeholders in relation to their intentions towards the wider environment for instance. Thus social research in sustainable development is also crucial.

This brings stakeholders in the field sharply into focus as social actors. In this regard, Priemus and Heuvelhof (2005) state:

... the behaviour of principals, architects, advisors, contractors, real-estate managers, and users has to be taken into account. Sustainability can be studied in a fruitful way with multiactor approaches.

(Priemus and Heuvelhof, 2005:3)

The literature identifies the key stakeholder levels in the field as housing users and housing practitioners (Melchert, 2007; Lorenz *et al.*, 2005; Koebel, 1999), and this serves as the stakeholder structure for a number of behavioural studies in sustainable development and housing construction. In these and other studies, government and government agencies at all levels provide the role of steering for sustainable development. This means that the requirements of government are effectively synonymous with the requirements of sustainable development for choice of housing construction materials and methods. This is evident in Bossink (2007) where the role of the Dutch government spanned both sustainable development innovation and sustainable development assessment; in Melchert (2007) and Williams and Dair (2007), where the policies and programmes of national governments in Holland and England respectively serve to promote sustainable development in the field; and in Scarpa and Willis (2010) who discuss sustainable development steering at the European Union level.

My review shows that many authors interrogate the behaviour of housing practitioners (Salè, 1998; Ngowi, 2001; Priemus, 2005; Sahota and Jeffrey, 2005; Bossink, 2007; Moore and Rydin, 2008; Brown and Vergragt, 2008), while others focus on the behaviour of housing users (Koebel, 1999; Scarpa and Willis, 2010; Rid and Profeta, 2011); and still others review the behaviour of both housing users and housing practitioners (Kaatz, 2005; Lorenz *et al.*, 2005; Williams and Dair, 2007; Crabtree and Hes, 2009; Hay, 2010).

Some of these studies focus on the behavioural aspects of innovation adoption (Koebel, 1999; Priemus, 2005; Bossink, 2007) while others are concerned with the behavioural aspects of the adoption of assessment tools (Courtney, 2001; Sahota and Jeffrey, 2005). Salè (1998) places the responsibility for the adoption of sustainable development innovations squarely with the architects as building designers, while Rid and Profeta (2011) interrogate the adoption of sustainable development technologies from the viewpoint of housing users. Sachs (1999), Jørgensen *et al.*, (2009) and Paredis (2011) all emphasise the interrelatedness of the behavioural aspects and the technical aspects of the effort to advance sustainable development, while Martens (2006) and Rid and Profeta (2011) highlight the need to shift focus to stakeholders' demand rather than the more common supply-driven approach, which focuses on the technical aspects of the problem of advancing sustainable development in housing construction. Kaatz *et al.* (2005) and Martens (2006) both stress the need to incorporate the different needs of the

various stakeholders from very early in the housing project. My critical review of this literature also shows the various aspects of stakeholder behaviour that are investigated. These include education and training (Salè, 1998), deep learning (Brown and Vergragt, 2008); co-operation and actor inter-relationships (Bossink, 2007; Moore and Rydin, 2008).

Choice behaviour is the focus in Crabtree and Hes (2009), Scarpa and Willis (2010) and Rid and Profeta (2011). These studies highlight the importance of the choice behaviour of housing users and housing practitioners to sustainable development in the field of housing construction. However, these authors approach their analysis of choice behaviour from a positivist epistemological standpoint that seeks to determine the extent to which stakeholders will choose options that advance sustainable development. They do not seek to identify the underlying mechanisms that determine these choices.

From this growing body of literature on choice in housing production, I reason that stakeholder choice behaviour in the field is crucial to advancing sustainable development. As Zhu *et al.* (2004), Rid and Profeta (2011) and many others show, stakeholders are still not widely choosing to use housing construction materials and methods that promote economic development and support environmental sustainability. Therefore a comprehensive, grounded and evidenced knowledge of the values and processes by which stakeholders arrive at choice decisions for housing construction options will provide the best basis for explaining the choices they make and predicting the way forward in advancing sustainable development through housing production.

Thus, stakeholders possess mechanisms of choice: values and choice processes.

At this stage, I considered it premature for me to conclude what the nature of the relationship was between the change mechanisms of sustainable development and the choice mechanisms of stakeholders in the field that determine the materials and methods that are used for housing construction. There were a range of possibilities that I considered as being possible to describe this relationship. They may be inimical to one another and mutually exclusive as authors such as Jørgensen *et al.* (2009), Brown and Vergragt (2010) and Hay (2010) have indicated, or there may be some other form of relationship between them. They may be alike, overlapping, or subsumed one in the other. These possible relationships are depicted graphically in figure 2 below.

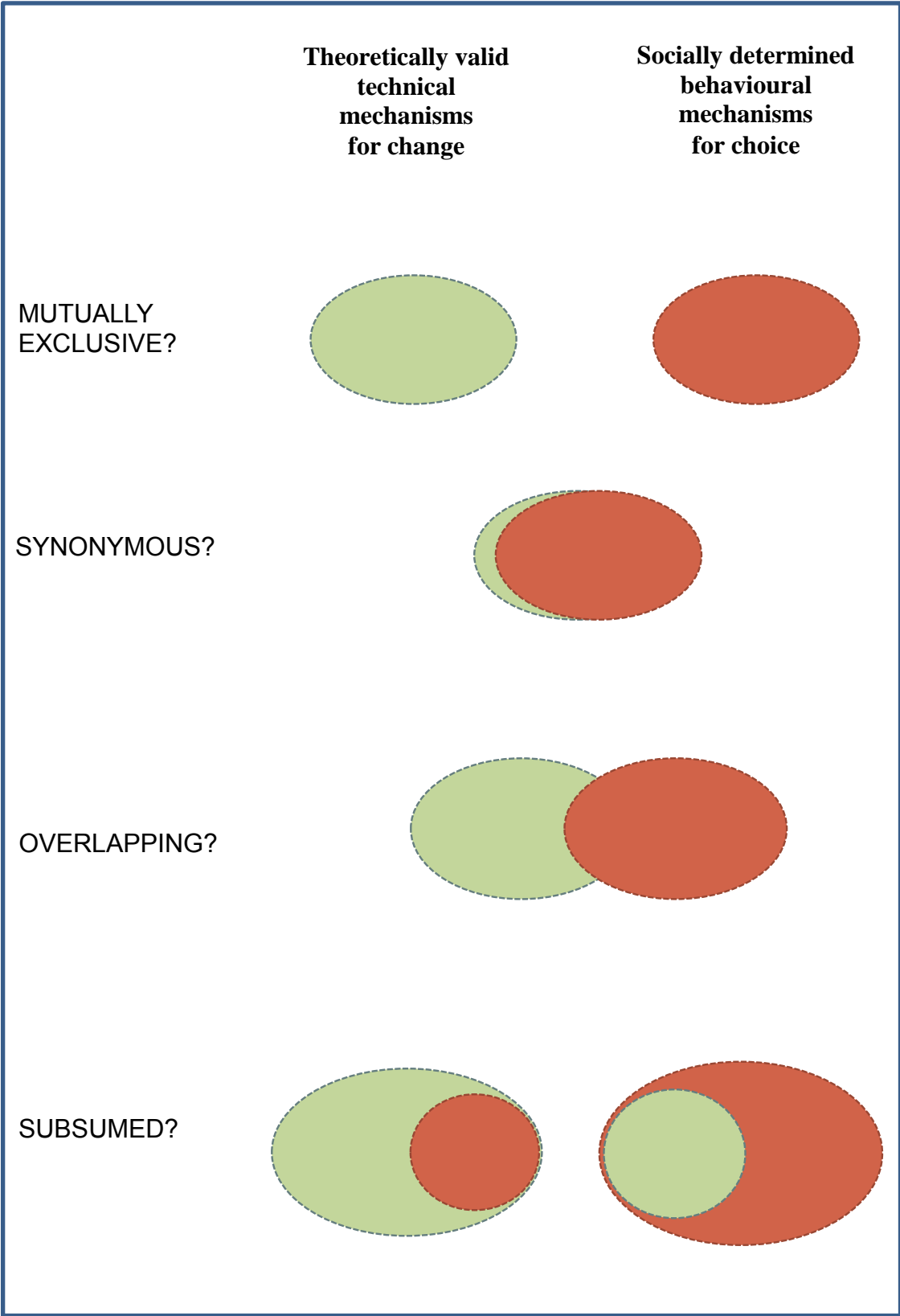


Figure 2: Possible forms of the relationship between choice and change

It was established from the literature that the nature of the relationship between policy makers and sustainable development requirements was synonymous. However the exact nature of the relationship between the change mechanisms of sustainable development and the choice mechanisms of housing users or housing practitioners still needs to be empirically determined.

Some authors have argued that for sustainable development to advance significantly, stakeholders in the field need to make fundamental changes to their present choice values and processes (Jørgensen et al, 2009; Hay, 2010). Others hold that success is best achieved within their inherent choice mechanisms (Melchert, 2007; Crabtree and Hes, 2009). This means that what is at issue here goes beyond understanding the choice mechanisms on which stakeholder choice decisions are based: because of the sustainable development ideology there is also the question of whether these inherent choice mechanisms should be upheld or altered. In other words, the question is both ‘What is?’ and ‘What should be?’

- The existence of stakeholders’ inherent choice mechanisms creates the ‘What is?’ portion of the problem.
- The existence of the normative concept of sustainable development creates the ‘What should be?’ portion.

I investigate these two portions of the research problem through my two research questions.

1.3 Research Questions and Research Logic

My review of the literature indicates that there is still a need for further theoretically and empirically grounded understandings of the determinants of choice behaviour of housing users and housing practitioners. All choice behaviour is determined by specific values and processes that are inherent in the choice decision maker. The stakeholders’ values determine why specific choice options are arrived at, while their choice processes describe how choice decisions are arrived at. Together, these values and processes constitute the decision makers underlying choice mechanisms.

Thus, I undertake this study to answer two research questions:

- I. What are the inherent choice mechanisms of stakeholders in the field of housing construction that determine their choice of housing construction materials and methods?
- II. What is the nature of the relationship between these stakeholders' choice mechanisms and sustainable development requirements for housing construction materials and methods?

As I have discussed above, studies show that at this time stakeholders in the field are still choosing housing construction materials and methods that impact negatively on sustainable development. I develop knowledge on stakeholders' choice mechanisms as a means of explaining this observed choice behaviour. Two stakeholder levels have been identified in the field of housing construction that are directly involved with choosing housing construction materials and methods: housing users and housing practitioners.

The logic of this study is that at each of these stakeholder levels, there is a universal set of choice mechanisms that determine why and how choice decisions are reached at that stakeholder level. These choice mechanisms are inherent to these stakeholders. They existed prior to, and are independent of, the relatively new understandings of the welfare requirements that sustainable development makes on the housing construction materials and methods that we use. Koebel (1999) points out the difference in the level of knowledge on housing construction technologies between housing users and housing practitioners. Similarly, Kaatz *et al.* (2005) show that for housing practitioners, housing production is perceived as a product to be completed, whereas users take a more long-term process view of housing production.

I have shown that the wider welfare concerns of sustainable development and the requirements it makes on housing construction technology choices are well spelt out in the literature: choose housing construction materials and methods that promote local economic development and support global environmental sustainability. However, the requirements of the various stakeholders in the field, and the underlying choice mechanisms that determine these requirements, have not been as well detailed from empirical research. Housing users are the first stakeholder level in the field of housing construction, comprised of members of the general public who are in a position to make choice decisions on the materials and methods to use for housing construction, based on

the fact that they are paying for them. Housing practitioners are a separate stakeholder level in this field, comprised of professionals and experts working in the production of houses who are in a position to make choice decisions on the materials and methods to use for housing construction. It is the choice decision mechanisms at these two stakeholder levels that I seek to understand

Furthermore, because the independent requirements of housing users, housing practitioners and sustainable development all affect choice of housing construction materials and methods, these various requirements are related in some way. This study aims to clarify the nature of the relationship between the requirements of the different stakeholders and sustainable development requirements.

But knowledge of underlying mechanisms goes beyond providing a basis for explaining what is and discussing what should be; it also provides a basis for predicting stakeholders' choice behaviour in given circumstances. This is classical realist epistemology and ontology as described by, among others, Lakatos, (1970), Hesse, (1974), Bhaskar, (1975) and Pawson and Tilley (1999). My research ultimately aims, therefore, to analyse the stakeholders' underlying choice behavioural determinants and their relationship to sustainable development and then use this knowledge critically to predict how sustainable development can advance in the field of housing construction.

1.4 The Theoretical Framework of the Study

The theoretical framework is provided in chapter 3. In it, I discuss three choice behaviour theories and their contributions to the analysis of the stakeholders' choice behaviour. These three theories are: choice theory; evaluation theory; and value theory. From the review of these choice behaviour theories, I find that choice theory provides the theoretical concepts with which to discuss and analyse the choice behaviour of housing users while evaluation theory provides the theoretical concepts for discussing and analysing housing practitioners' choice behaviour. Value theory is relevant to both stakeholder levels as well as to the normative concept of sustainable development.

It is through these three choice behaviour theories that understandings of choice mechanisms have been developed: the values that determine why given choices are

preferred as well as the processes that describe how choice outcomes are arrived at. By superimposing the stakeholder structure of a housing user stakeholder level and a housing practitioner stakeholder level onto these choice behaviour theories, I thereby create the theoretical framework on which I undertake the empirical research. I represent this theoretical framework graphically in figure 3 below.

At this theoretical level, I can reasonably expect that these concepts will be applicable in a wide range of contexts, the empirical peculiarities of my study area, Uyo, Nigeria, notwithstanding. The values and processes that determine housing users' and housing practitioners' construction technology choices, and the way these determinants are related to sustainable development should be largely globally generalizable. From the literature, I show that sustainable development steerage, and its requirements for change to the housing construction technologies we use, is well defined from sustainable development theory. My study aims to use choice behaviour theories to explain the requirements for choice of housing construction technologies at the housing user and housing practitioner stakeholder levels. With this knowledge, I aim to produce a propositional model of the relationship between these stakeholder requirements and the requirements that arise from sustainable development steerage for change.

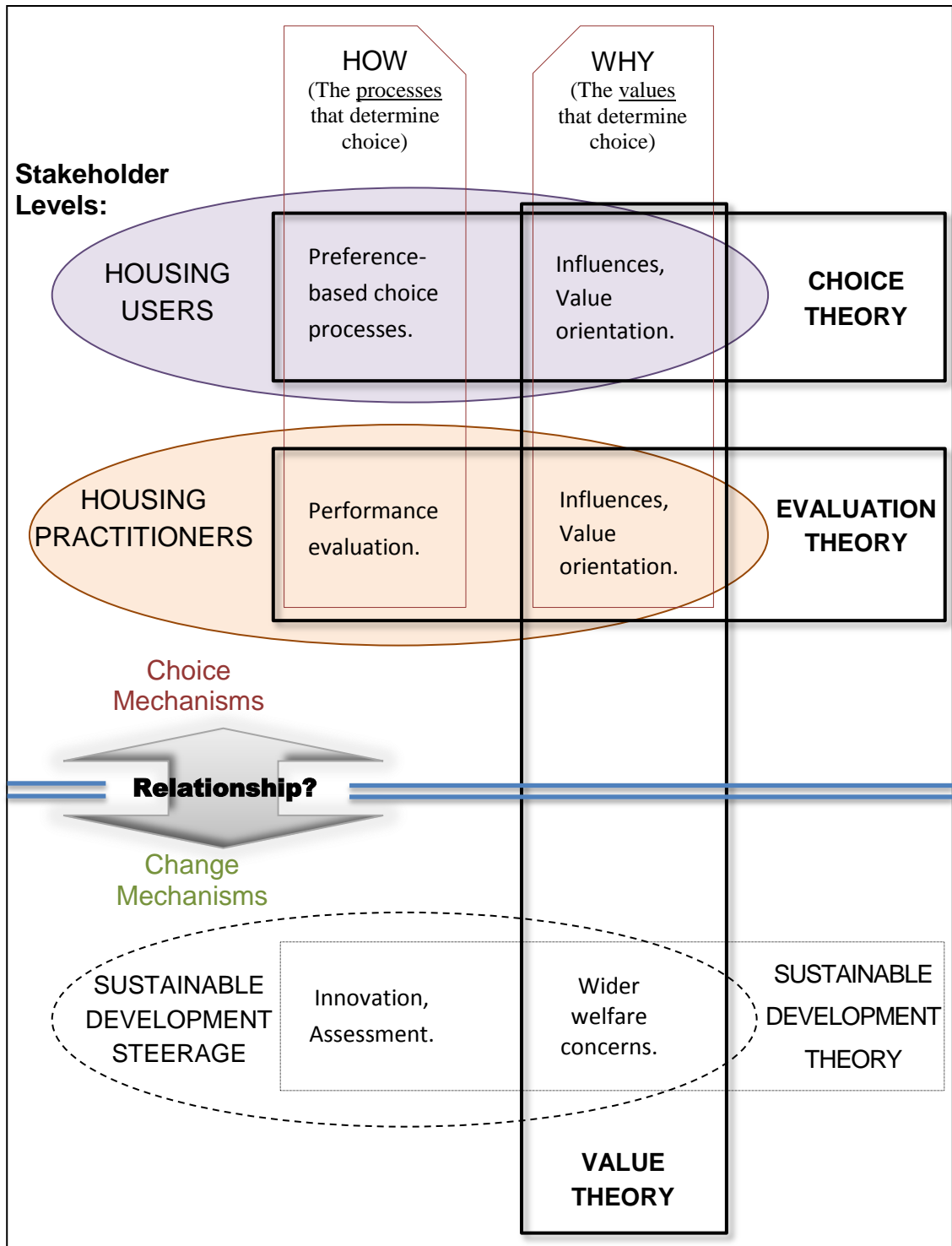


Figure 3: Theoretical Framework: Choice Theory, Evaluation Theory and Value Theory

1.5 Investigating the Research Problem

As this research is a behavioural study in the social sciences, I use a qualitative research strategy. Furthermore the qualitative research strategy is the most suitable for the inductive reasoning I employ in the exploratory study. It is also well suited to realist epistemology and ontology which seeks out underlying mechanisms and accepts them as valid knowledge. Most importantly, this strategy enables me to analyse the case of study using the stakeholders' own voices and their own expressions of their position on the issues that I raise.

In chapter 4 I discuss in detail the basis for choosing Uyo, Nigeria as the context of the study. I outline three crucial attributes of this context that make it an instrumental case for the investigation of stakeholders' inherent choice mechanisms when faced with decisions on choice of housing construction materials and methods. These attributes are:

- 1 Stakeholders in Uyo are constantly faced with a choice of house types distinguished by the materials and methods by which they are built.
- 2 Uyo is in a developing region so environmental issues would not be expected to override economic issues.
- 3 Uyo has no overt sustainability regimes that could be argued to have interfered in the data on inherent choice mechanisms.

These attributes make Uyo a suitable context for investigating the research problem.

In chapter 5, I set out the research methodology. Here I discuss the logic for my choice of a qualitative case study design for the research. The case of study is given as the inherent choice mechanisms of housing stakeholders in Uyo for decisions on housing construction materials and methods, as well as the ways that these inherent choice mechanisms and sustainable development requirements in the field are related. The qualitative case study research design enables me investigate the case of study in depth and holistically using interview methods. I also show in this chapter how I apply the case study research design to ensuring the quality of the research with particular reference to three dimensions of quality: understanding behaviour; generalising the findings and conclusions; and maximising the relevance of the study to improving real world human conditions.

There will be no doubt in the reader's mind that I am pro-sustainable development. Therefore I also discuss in chapter 5 how I deal with keeping out my own biases in order to try and ensure objectivity in the research study. I seek to achieve this objectivity by focusing on the research participants' own voices throughout the data collection and analysis. Nevertheless, I am aware of, and explicit about, my own position on the topic.

Finally, throughout the thesis, I use the generic 'he', 'him' or 'his' to refer to 'anyone'. This is a simple courtesy arising from the fact that I am female; it does not overlook any gender.

1.6 Chapter Summation

This PhD uses social science research methods in an exploratory study of the choice behaviour of stakeholders through an empirical investigation conducted in Uyo, Nigeria. It investigates the stakeholders' choice behaviour when faced with choice decisions on housing construction options as well as the place of sustainable development concerns in these choice decisions. The aim is to produce detailed theoretical understandings of stakeholders' inherent choice mechanisms and to offer a propositional model of how these identified choice mechanisms are related to sustainable development. The conclusions and recommendations from this study will contribute to safeguarding and improving human welfare by showing how the choice values and choice processes used by housing users and housing practitioners can contribute to the advancement of sustainable development in the field of housing construction.

The first step in this research is a detailed and comprehensive critical review of the literature in order to analyse the current state of knowledge on the topic of choice behaviour in sustainable development and housing production. This literature review is provided in the next chapter.

Chapter 2

Sustainable Development and Housing Construction

- A Literature Review

2.1 Introduction to the Literature Review

This critical review of the literature is focused on three key areas: the concept of sustainable development; sustainable development and housing construction; and stakeholders in the field of housing construction. The objectives of this critical review of the literature are:

1. To establish an operational conceptualization of sustainable development.
2. To understand how this conception of sustainable development functions in the field of housing production.
3. To identify the stakeholders who are relevant to the advancement of sustainable development in the field of housing production.

2.2 Sustainable Development

A very large number of definitions of sustainability and sustainable development can be found in the literature (Dobson, 1996; Meadowcroft, 2000; Das, 2006). Aljammaz (2006), Dresner (2002) and Mebratu (1998) all hold that the best way to clarify the concept of sustainable development is by means of a review of its historical development and subsequent widespread acceptance. However, Dobson (1996) explains that this kind of discursive approach to understanding a concept is limited because it becomes obsolete as new developments occur. Dobson (1996) further points out that a definitional approach is also problematic for understanding sustainable development because of the large number of ‘contested and contestable’ definitions that have been proposed. This author therefore advises an analytical approach that incorporates the discursive and the definitional but also gives a full and comprehensive analytical

account of what constitutes the concept. He points out that this approach would result in the identification of more than one typology.

Indeed three typologies are identified in this study. The first is a clarified conceptualization of sustainable development, which is adopted for this research. The second is an ecocentric reading of sustainability and the third is a homocentric reading of sustainability, both of which are argued against. A brief outline of the historical development of the concept of sustainable development, and its international, national and industry level adoption is presented below. This is followed by a study of the Brundtand Report definition of the term and a comprehensive and explicit analysis of what sustainable development entails. The result is a clear and widely accepted definition of the term 'sustainable development' and an understanding of its operational frame.

2.2.1 Defining sustainable development

Mebratu (1998) undertakes a historical and conceptual analysis of the concept of sustainability and sustainable development. Mebratu (1998) holds that natural systems, with their self-regulatory mechanisms, are sustainable and mutually supporting. The paper states, however, that the development and complexity of modern society, combined with population growth of the human species, has induced changes in the natural order. The study reports that the population of mankind has shown continuous growth, numbering about 10 million by 6,000BC and expanding to approximately 800 million by the 18th century and to more than 5 billion by 1990. This exponential population growth was supported by mechanisation and accelerated changes within the last century in production capacities, the access to information and increased interdependencies in a globalising world. These complexities, brought on by industrialization and globalization, led to severe environmental, socio-cultural and economic dysfunction. Sustainable development is one of the concepts Mebratu (1998) describes as having developed as a strategy to cope with this far-reaching 'systemic dysfunction' (Mebratu, 1998:493). The paper holds that the inherent value concepts of sustainable development, looking after the earth and other people, are as old as civilization itself. However, according to the study, the unprecedented complexities that have developed in the world in the last century have given the concept of sustainable development a new urgency.

Dresner (2002) traces the end of sustainable living to this same period, the age of enlightenment when nature became perceived as an enemy to be conquered. This, he explains, is the period when the growth and harnessing of knowledge in the Western world led to exponential increases in the methods of production and patterns of consumption which have been identified as inimical to the ecosystem. Smith (2005) adds the point that advances in health care led to fewer deaths and increased life expectancy, which resulted in unprecedented population growth in the past century. Diverse and widespread pollution, resource depletion and destruction, loss of soil fertility, loss of biodiversity, soil erosion, deforestation, desertification, eradication of species and habitat, the build-up of carbon dioxide in the atmosphere resulting in climate change, depletion of the ozone layer and the extreme poverty of so many are some of the symptoms Vilches and Pácrez (2009), Halliday (2008), Dresner (2002), Edwards (2002), Smith (2005) and Roaf (2007), among many others, identify as arising from this new world order of rapid economic and population growth.

Hill and Bowen (1997) and Dresner (2002) both provide chronological reviews of the development of concerns about the environmental damage resulting from the activities of mankind. According to their reports, from the middle of the 20th Century, ever increasing attention became focused on the detrimental effect of progress on the fragile ecological systems on which the existence of mankind depends. A number of significant actions and events occurred from the late 19th Century in direct response to the growing understanding of the deterioration in the earth's ecosystem as a result of population expansion and human development. These were given by Dresner (2002) as the rise of the environmentalist movement and the conservationist movement, leading up to the first Earth Day held in 1970; the energy crisis of the 1970s; and the report commissioned by President Carter of America on the state of the environment up to 2000. This report stated that if advancement strategies were not altered, 'life for most people on earth will be more precarious in 2000 than it is now...' (Barney, 1981:1). The 1972 United Nations Conference on the Human Environment held in Stockholm created a global forum for the concern about environmental problems. Dresner reports that eventually, in 1974, the ecumenical study conference on Science and Technology for Human Development convened by the World Council of Churches where the concept of 'sustainable society' first emerged, founded not on environmental concerns but on the concern for the human condition. It is from here that the idea of a meeting

point of concern for the global environment and concern for global social justice became known.

In 1980, the publishing of the World Conservation Strategy by the International Union for Conservation of Nature and Natural Resources (IUCN) first introduced the term 'sustainable development' (Trzyna, 1995), defined as 'the integration of conservation and development...' (IUCN/UNEP/WWF, 1980). However, Hill and Bowen (1997) and Dresner (2002) show that the term 'sustainable development' did not attain world prominence from this 1980 IUCN publication, but rather from the 1987 report of the World Commission on Environment and Development (WCED) entitled *Our Common Future*. *Our Common Future* is also called The Brundtland Report after the Chairperson of the Commission, Gro Harlem Brundtland.

Mebratu (1998) writes that The Brundtland Report stands out among other global initiatives because it succeeded in bringing about a critical turning point in international political action on the environment. The term 'sustainable development' became firmly integrated into global discourses from its use by the Commission, as Brown and Bhatti (2003) and many others testify. Similarly, Dresner (2002) credits the Brundtland report with winning and maintaining worldwide attention on issues of the environment. Steele (1997) further holds that one of the most important contributions of this report was highlighting the dichotomy in both the values and the standards of living between the rich and poor countries that the ecological debate expected, replacing this dichotomy with equitable expectations. Dresner (2002) shows that its success is largely due to the integration of the seemingly opposing environmental concerns of the economically developed North and the economic concerns of the developing nations of the geographic South. Previous to the publication of the report, debates raged about whether economic development should be prioritised to the detriment of environmental management, or whether environmental conservation should be the focus, at the cost of economic development in the developing regions of the world; these debates polarised the North and South (Grainger, 2004; Dresner, 2002).

Sustainable development was used in the Brundtland Report to denote a concept of economic development and progress that does not harm the environment or deplete precious resources. The Brundtland Report is generally seen as having succeeded in unifying the two objectives of environmental sustainability and economic development into a united global agenda (Steele, 1997; Dresner, 2002). Meadowcroft (2000),

Dresner (2002) and Grainger (2004) attribute the success of the Brundtland Report representation of sustainable development in overcoming the global divide to two of its features:

- i.) Firstly, they show that the Brundtland Report was considered visionary in as far as it accepted and incorporated the need for human progress and development, unlike previous environmental movements that advocated reductions in economic growth and human development as the solution to environmental stewardship.
- ii.) Secondly, they point out that the report linked poverty firmly to environmental damage for the first time, as opposed to the prevailing notion at that time which viewed environmental damage as resulting mainly from excessive consumption in the advanced nations. The report highlighted the need to urgently pursue the eradication of poverty and the improvement of economic growth in developing nations in order to secure both the goal of environmental sustainability itself and the equally important and independent goal of socio-economic development.

Ngowi (2001) illustrates this second point further. In describing the rural populations of developing regions, the paper states: ‘Short-term survival pressures often force these rapidly growing rural populations into practices that cause long-term damage to forests, soil and water’ (Ngowi, 2001:292); and similarly for the urban populations: ‘In the densely populated cities of the developing countries ... the challenge is whether it is physically possible to protect sufficient natural resources in built environments to further contribute to sustainability needs’ (Ngowi, 2001:292).

Meadowcroft (2000) comments that the Brundtland Report presents a scenario where it is no longer necessary, or even useful, to choose either environmental protection or societal advancement. Economic advancement can and should be pursued, but in ways that support the preservation of the environment. Hodge (1997) describes this value system as ‘a parallel care and respect for the ecosystem and people within – not one or the other, not one more than the other but both together as one’ (Hodge, 1997:8). Steele (1997) states: ‘The concept of sustainability, then, has been inextricably linked to development and by extension to economics’ (Steele, 1997:6). Similarly, Dresner (2002) observes: ‘Rather than challenge the idea of economic growth directly, the concept of sustainable development sought to modify the *kind* of growth strategies that

were pursued' (Dresner, 2002:63, emphasis from original). Thus sustainable development pursues both environmental and economic improvement.

Sustainable development represents a paradigm shift which incorporates both promoting economic development and supporting environmental sustainability. The difference in the sustainable development paradigm is given as the understanding that economic growth and development is not directly correlated with the consumption of resources as previously assumed. This difference in thought is what Paredis (2011) describes as 'decoupling growth from resource flows' (Paredis, 2011:207). The two models presented below, in figures 4 and 5, graphically illustrate mankind's increased understandings of how economic development and environmental sustainability affect human welfare after the paradigm shift of sustainable development.

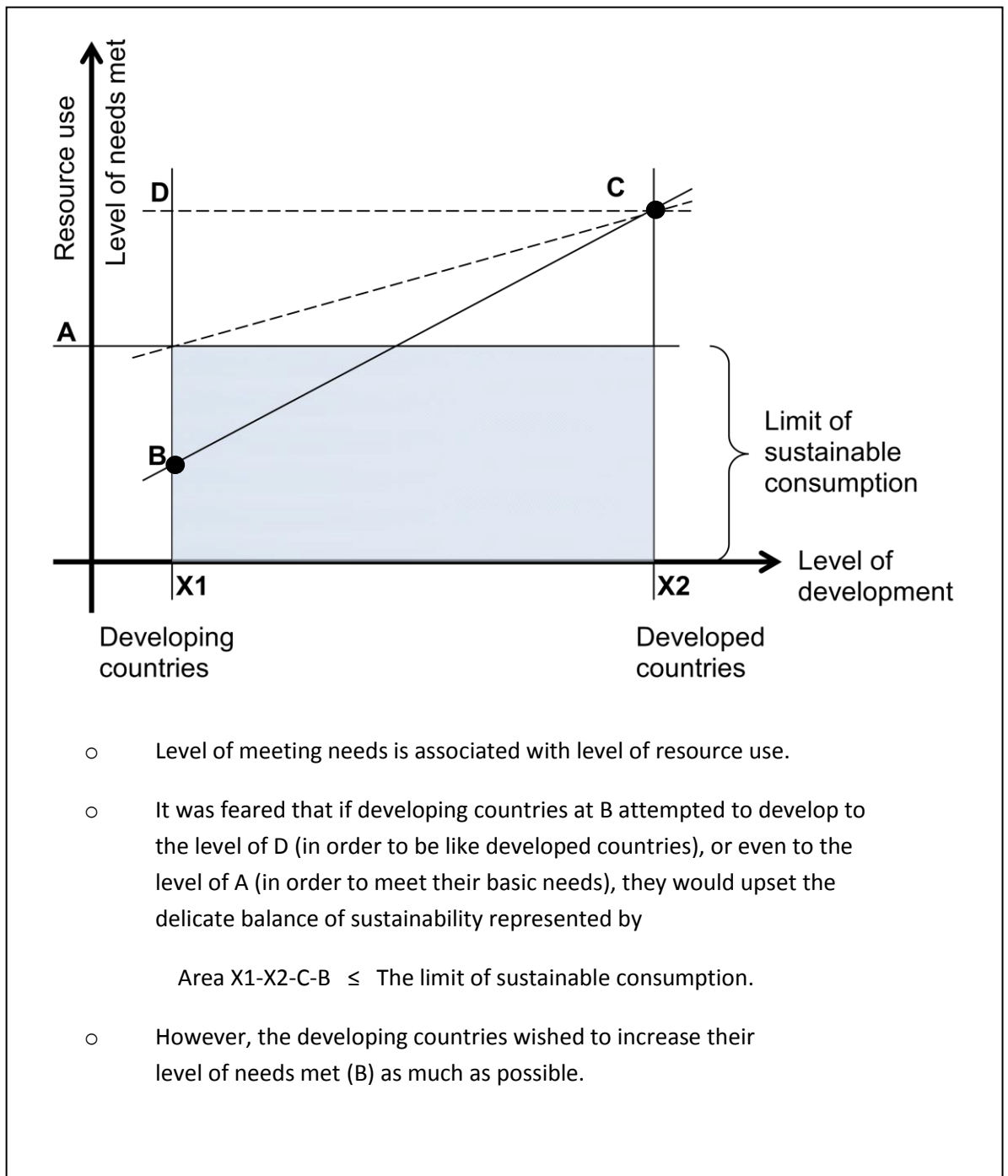


Figure 4: *Pre-sustainable development - Development versus sustainability*

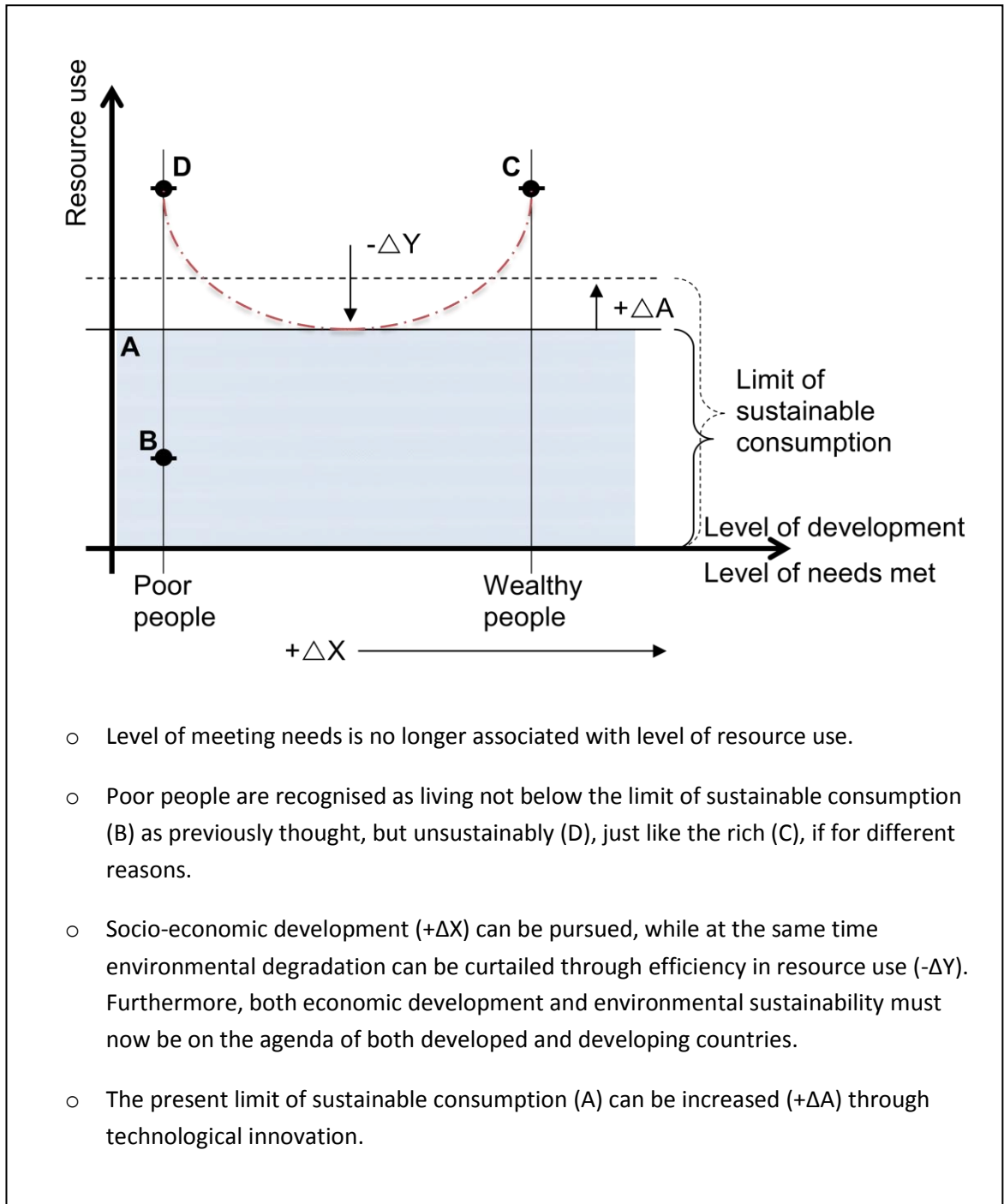


Figure 5: *Sustainable development - development together with sustainability*

Following the release of The Brundtland Report, a number of agreements and actions aimed at securing sustainable development have been quickly undertaken. The tenets of sustainable development received wide acclaim and rapid adoption in international, national and professional spheres. A number of global, national and local initiatives,

conferences, declarations, policies, and programmes have now been instituted. The response of the international community, particularly the United Nations, the World Bank and the International Monetary Fund, is seen to be widespread and on-going. The United Nations Conference on Environment and Development (Earth Summit) was held in 1992, which resulted in the Rio Declaration on Environment and Development (UNEP, 1992). Agenda 21 (UN, 2004) was the document produced to detail the framework for action on sustainable development, which is to be implemented by the United Nations Commission on Sustainable Development, and is based on ‘the acceptance of the need to take a balanced and integrated approach to environment and development questions’ (UN, 2004).

The World Summit on Sustainable Development was held in Johannesburg in 2002, and was attended by over 180 nations and a wide range of agencies and organizations (UN, 2002). The United Nations also declared a Decade of Education for Sustainable Development starting in January, 2005 in order to incorporate the principles, values and practices of sustainable development into the learning process. In September, 2000 eight Millennium Development Goals were set out by the United Nations to support the world’s poorest people (UN, 2000b). The World Bank and the International Monetary Fund also adopted the principles of sustainable development in their agendas. The World Bank currently has a Sustainable Development Unit headed by a Vice President. In the light of these far-reaching initiatives, Mebratu (1998) holds that the Brundtland Report ‘has been highly instrumental in developing the new world view that is emerging today’ (Mebratu, 1998:503). Governments around the world also began to take action based on the goals of sustainable development, as Meadowcroft (2000), Priemus and Heuvelhof (2005) and others report.

The 1998 UK government report on sustainable development identifies four interconnected themes: the first relates to the needs of all people; the second relates to environmental protection; the third concerns far-sightedness in the use of natural resources; and the fourth concerns the importance of economic growth and high levels of employment (DETR, 1998). The report also recognizes the key role that change plays in the move towards sustainable development.

The Nigerian government is an active member of the United Nations and was one of the original countries that ratified Agenda 21, the plan of action on sustainable development that resulted from the United Nations’ Conference on Environment and Development in

Rio in 1992. As a member of the United Nations General Assembly, Nigeria has also adopted the Millennium Declaration of 2000 where they resolve, among others things, that:

We will spare no effort to free our fellow men, women and children from the abject and dehumanizing conditions of extreme poverty, to which more than a billion of them are currently subjected. We are committed to making the right to development a reality for everyone and to freeing the entire human race from want. (UN, 2000a)

and

We must spare no effort to free all of humanity, and above all our children and grandchildren, from the threat of living on a planet irredeemably spoilt by human activities, and whose resources would no longer be sufficient for their needs. (UN, 2000a)

Both Agenda 21 and the Millennium Declaration are outcomes of The Brundtland Report.

The definition and description of the term ‘sustainable development’ given in The Brundtland Report is the most commonly cited one (Winston and Eastaway, 2008). Mebratu (1998), Adams (2001) and Dresner (2002) all report that the definition of sustainable development contained in The Brundtland Report is considered by some to be vague because clear policy and practical action cannot be taken based on this definition. However, Mebratu (1998) and Daly (1996) argue that the generic nature of the definition of sustainable development in the Brundtland Report actually worked in its favour, as it enabled global agreements to be more easily secured than if it had been specific prescriptions for action. Edwards (2002) also agrees that the generic nature of the definition is an advantage: ‘The Brundtland definition outlines a philosophy which benefits from a degree of imprecision. There is a general understanding and set of principles which allow useful sub-definitions to be framed within its broad embrace’ (Edwards, 2002:7).

Mebratu (1998), however, holds that it is the duty of the scientific community to strengthen the ‘logical coherency within the concept’ (Mebratu, 1998:518) in order to progress our understanding and practice of sustainable development. This review aims to clarify sustainable development through a critical analysis of The Brundtland Report and its description of what constitutes sustainable development.

The World Commission on Environment and Development (WCED) was given a mandate to produce 'a global agenda for change' (WCED, 1987). Their ensuing report, the Brundtland report, gives the following definition of sustainable development:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and

the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

(WCED, 1987)

A critical analysis of the concept of sustainable development as it is presented in the widely acknowledged Brundtland Report, *Our Common Future*, reveals that sustainable development is a homocentric concept in which sustainability and development are equally important and need to be integrated, just as its name implies, and this is for both the rich countries and the poorer countries (WCED, 1987). Sustainable development here is based on two equity principles; the principle of intergenerational equity, which demands equity between generations; and the principle of intragenerational equity, which demands equity within this generation. Table 1 briefly highlights the main points The Brundtland Report makes in explaining the idea of sustainable development.

VISION:	
The report is a vision of a future where economic development and environmental sustainability are a unified, compatible agenda for change.	
TERMS:	
Development is characterized as a transformation of economy and society in order to satisfy the needs and aspirations of the present.	Sustainability is a notice served on mankind based on scientific evidence of environmental stresses, and limitations of the earth's ability to meet future needs.
SOURCE OF THE PROBLEMS:	
Widespread poverty arising from current practices in the use of economic capital.	Threats to the natural environment arising from the everyday actions of both poor people and the more prosperous in their use of natural capital.
DIMENSIONS/DOMAINS:	
Development is a goal of economic and social advancement, and it is based on needs. Widespread poverty means that many people living today are unable to meet their basic needs.	Sustainability is a limit of resource consumption, and is based on the carrying capacity of the earth and the prevailing state of technology. Prevailing practices would exceed these limits thereby compromising the opportunities of future generations.
RECOMMENDATIONS:	
Sustainable development requires local economic growth, particularly in the Third World countries of the global South, through all spheres of human endeavour.	Sustainable development requires environmental stewardship worldwide through all spheres of human endeavour.
VALUE PRINCIPLES:	
The goal of economic development is based on the principle of intragenerational equity.	The requirement of environmental sustainability is based on the principle of intergenerational equity.
OPERATION:	
The concept of sustainable development provides a framework for changing our everyday activities in order to integrate sustainable practices and developmental strategies.	

Table 1: *A critical analysis of sustainable development as it is presented in The Brundtland Report*

According to the Brundtland Report, sustainable development is an urgent call for change in which “sustainable” operates in the domain of environmental issues, while “development” finds its operation in issues concerning socio-economic progress; and both of these domains are required to be integrated in a multidisciplinary approach to the judgement of our actions. The Brundtland Report is an urgent call for action. It specifies the course that change should take and highlights the need for integrated changes at all levels, stating:

In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations. (WCED, 1987)

Technology is a factor that was considered to be of pivotal importance in the Brundtland Report. Firstly, the form of technology in present use, which increased productivity and therefore prosperity and progress, is considered to be a primary cause of the environmental stresses observed. Secondly, technology is expected to play a major role in the resolution of these concerns of both environmental damage and human poverty. The Brundtland Report both defines the direction of change and indicates the volume of change required in relation to the role technology plays in achieving sustainable development:

The fulfilment of all these tasks will require the reorientation of technology, the key link between humans and nature. First, the capacity for technological innovation needs to be greatly enhanced in countries of the global South so that they can respond more effectively to the challenges of sustainable development. Second, the orientation of technology development must be changed to pay greater attention to environmental factors. (WCED, 1987)

Governance and the institutional and legal framework is another overriding factor given careful and detailed consideration in the report. The Brundtland Report recommends the generation and implementation of sound sustainable development policies at international, national and regional levels as a driver for change. The report also indicates the importance of ensuring that informed choices are being made in all fields. (WCED, 1987)

As the critical review has shown, The Brundtland Report presents an explicit definition and meaning of sustainable development (Halliday, 2008) in which the values and

objectives are clearly stated (Hodge, 1997) and that fully embodies the normative value principles of intergenerational and intragenerational equity on which the concept of sustainable development is based (George, 1999). For the purpose of this research this definition and meaning of sustainable development will be used.

Other authors provide useful extensions of The Brundtland Report's description of modern technology as it relates to the environment and the economy. Lyle (1996) offers a discussion on the current modes of technology as they affect the environment. The study describes the current technology modes as 'degenerative' and in need of change because of their unsustainable use of resources and the unsustainable levels of air, water and land pollution that they generate and calls for technological change in order to restore the environment. Dinopoulos and Segerstrom (1999) as well as Johnson (1997) discuss the impacts of the state of technology in relation to economic issues. They show that the current state of technological advancement has resulted in unprecedented increases in wage inequality, reduced average real wages and increased unemployment. Johnson (1997) observes that technological modes that can increase the output of both skilled and unskilled labour would not have these negative effects.

Sustainable development operates in two domains, as the name itself indicates and as the above discussion has shown: the economic domain and the environmental domain. A parallel 'sustainability' discourse has, however, dominated the literature on sustainable development almost from the start (Dresner, 2002). Meadowcroft (2000) shows that in practice, particularly in the developed world, this parallel sustainability discourse has resulted not in the expected integration of economic and environmental considerations but rather in 'various ways in which the environmental can be factored into societal decision-making at all levels' (Meadowcroft, 2000:378). This 'sustainability' discourse, and the difference it makes, requires further attention.

2.2.2 Sustainability is not sustainable development

In spite of the widespread recognition and adoption of the concept of sustainable development presented in The Brundtland Report, sustainable development has seen a great deal of reinterpretation and many authors have reported on the many alternative definitions of the term available in the literature (Holmberg and Sandbrook, 1992; Aljammaz, 2006; Das, 2006; Pearce *et al.*, 1989). Mebratu (1998) undertakes a

conceptual analysis of the terms sustainability and sustainable development. This conceptual analysis of the many definitions of sustainable development interrogates such questions as the problem that the definition is responding to and its main approach to the solution of the identified problem. The results of the study reveal that the multitude of definitions which have grown to describe the concept of sustainable development tend to be produced within the narrow context of each individual group's agenda rather than being based on theoretical objectivity.

A review of the literature shows that the most dominant of these reinterpretations of sustainable development found in the literature treats sustainability as the singular objective of sustainable development, effectively silencing the development objective. The work of Pearce *et al.* (1989), for instance, was influential in popularising and theorising an approach described as 'greening'. As a good illustration of this widespread discourse, I offer this quote from Zheng and Dai (2012):

Sustainable development implies harmony on human-environment interactions and inter-generation responsibility, with emphasis on a harmonious relationship among population, resources, environment and development, so as to lay a sustainable and healthy foundation of resources and environment for future generations.

(Zheng and Dai, 2012:86)

Dobson (1996) describes sustainable development as a theory of environmental sustainability. The study makes this claim:

Sustainable development, therefore, amounts to a strategy for environmental sustainability because of the belief that a particular form of development will provide the conditions within which environmental sustainability can be guaranteed.

(Dobson, 1996:423)

This claim demonstrates clearly the singular objective of environmental sustainability, with development merely serving as a vehicle to achieve the objective. The critical analysis of sustainable development offered above shows that this is a misinterpretation of the concept.

Dressner (2002) holds that this misinterpretation of sustainable development and its objectives could be attributed to the strength of the environmentalist movement and their sustainability agenda. Steele (1997) explains that the environmentalists are suspicious of the word "development" because it had become associated with destruction of the ecology, rather than as the 'enlightened improvement'

(Steele, 1997:21) that the term represents here. Thompson (2007), himself an example of an ecocentric environmentalist, states that sustainable development is problematic in environmental ethics because of its requirement for economic growth. This clearly demonstrates the aversion of environmentalists to economic development.

Thompson (2007) is one of the authors that make a clear distinction between two forms of environmentalism: the homocentric form which values the environment for the sake of human welfare; and the ecocentric form which gives intrinsic value to the environment itself rather than for its use to man. Also, Dobson (1996) states that environmental sustainability may or may not take the homocentric form, whereas sustainable development is purely homocentric. Thus three ideologies are clearly identified.

‘Sustainability’ initially referenced the environmental/ecological domain while ‘development’ referenced the socio-economic domain (WCED, 1987). However, Campbell (1996) extended the notion of sustainability to encompass three requirements – social sustainability, economic sustainability and environmental sustainability, often referred to as the ‘triple bottom line’ of sustainability. Glavič and Lukman (2007) offer a definitional review of the many terms that have come into use around this ‘triple bottom line’ conceptualization of sustainability. Even in their study, where social, economic and environmental sustainability are given as the three sustainability requirements, the emphasis is stated as being on environmental issues.

Other authors have added other requirements to these three widely accepted ones. For instance Hill and Bowen (1997) as well as Dalglish *et al.* (1997) added technology as a fourth pillar of sustainability; while Agenda 21 (UN, 1992) and Eastaway and Stoa (2004) counted an institutional or governance pillar as their fourth pillar. Indeed, the literature shows that technological innovation and steering through governance are both crucial action areas, in addition to the development of assessment tools for making informed choices, and these action areas will be discussed in detail as this review progresses.

Das (2006) and Guy (2005) are among the authors that present an analysis of sustainability definitions from a range of sources, and both studies show that these definitions usually promote this triple bottom line model of sustainability. Priemus (2005) refers to this departure from the original use of sustainability in relation to the field of housing, stating

The definition of ‘sustainability’ is often stretched somewhat in discussions on the theoretical and practical aspects of sustainable housing. In addition to stressing the ecological dimension – as in the case of the Brundtland Report – it is extended to social and economical dimensions. (Priemus, 2005, p6)

Priemus (2005) maintains that the ecological domain is the appropriate domain of sustainability.

Mebratu (1998) and Marcuse (1998) are among a number of authors who point out that sustainability is about sustaining the environment while sustainable development is about sustaining the environment *and* developing the economy. Mebratu (1998) criticizes the triple-bottom-line notion of sustainability for its reductionist approach of treating the environmental, economic and social systems as if they are three independent systems with possible areas of overlap. The study holds that the ‘triple bottom line’ model is faulty because in the real world, the economic system is wholly positioned in the social system, which is itself wholly positioned in the environmental system.

Marcuse (1998), for his part, argues against presenting sustainability as a goal for the economy or for society. This study holds that it is illogical to speak of economic sustainability or social sustainability since it has never been an aim to “sustain” economies and societies, but rather to develop them; only the natural systems that support life require sustaining. Marcuse (1998) shows that sustainability is not an objective, but a limiting requirement on projects. The paper therefore concludes that sustainability is in fact a constraint on the achievement of other goals and objectives, and holds that it is important to make the distinction between goals and constraints because of how goals and constraints are used. Marcuse (1998) concludes the argument by asserting that enabling all people to meet their needs through economic development is the goal of sustainable development and it is on this goal that effort should be focused. While I agree with the central assertion that a constraint is easier to proscribe, I see no evidence to suggest that economic development, any more than environmental sustainability, should be the main focus of sustainable development.

Schmidheiny (1992), George (1999), Meadowcroft (2000), Dresner (2002), Martens (2006) and Halliday (2008) are among the many other authors that offer arguments for preferring the original model of sustainable development as it is interpreted in The Brundtland Report, where environmental sustainability and economic development are equally important for meeting present and future needs. Schmidheiny (1992) describes

the link between environmental sustainability and economic development as inextricable and holds that together they make the difference to the quality of present and future life.

George (1999) distinguishes between issues that relate to environmental conservation and issues that affect quality of life. George (1999) asserts that while intergenerational equity involves environmental conservation and is a necessary condition for sustainability, intragenerational equity contends with social and economic progress and is a necessary condition for development. The paper maintains that the principles of intergenerational and intragenerational equity enshrined in the Brundtland report together define and clarify the concept, meaning and values of sustainable development completely.

Meadowcroft (2000) points out that the establishment of sustainable development as a concept derived from both the urgent changes needed in economic activities to enable the poor meet their current needs, and the need to avoid permanent damage to the earth's natural systems to ensure that people are able to meet their needs in the future. Martens (2006) described sustainable development as providing for mankind's fundamental needs without harm to nature. Similarly, Halliday (2008), acknowledging the two interrelated domains of operation of sustainable development, writes: 'it has taken a very long time for sustainable development to be recognised as a justified restraint on inappropriate development and a primary driver of improving quality of life for all' (Halliday, 2008:5).

The interlinked nature of the economy and the environment is recognised and applied in other fields of endeavour. For instance, Marsden (2010) highlights the value of integrating concerns for both economic and environmental impacts from agricultural production on rural development and shows the synergies this produces. Marsden (2010) describes this concept as 'eco-economy', stating:

Importantly, these do not result in a net depletion of resources but instead provide cumulative net benefits that add value to rural and regional spaces in both ecological and economic ways. (Marsden, 2010:226)

Similarly, McCarthy *et al.* (2002) show that National Parks, previously perceived primarily as places for environmental protection and conservation, have now adopted an improved approach that incorporates sustainable development, in recognition of the

need to support the socio-economic development of the local community in addition to providing environmental protection.

In essence, this discussion shows that the fundamental difference between the sustainability discourse and the concept of sustainable development is that where 'sustainability' is the conceptual framework, sustainability, particularly environmental sustainability, is the goal. However, where 'sustainable development' is the conceptual frame, environmental sustainability and economic development are pursued with equal vigour. Therefore, sustainability cannot be said to be the primary objective of sustainable development. As the Brundtland Report clearly points out, the overall aim of sustainable development is to ensure: 'sustained human progress ... for the entire planet into the distant future' (WCED, 1987) based on a strategy of integrating 'economic and ecological considerations in decision making' (WCED, 1987).

Sustainable development has been shown to be a normative, principle-based concept; a vision of a better outcome in which both present and future generations are not hampered in their ability to meet their needs; a general framework for change applicable in all fields of human endeavour where economic and natural capital are used; and a requirement that we review and alter the impacts that our use of natural and human capital creates in the two domains of environmental sustainability and socio-economic development. Sustainable development, based on the Brundtland Report definition, principles and domains of operation, stems from a clear homocentric value ethic that places mankind's needs as the primary consideration (WCED, 1987; Thompson, 2007). In this form, sustainable development provides a globally coherent theoretical structure on which to examine any field of human endeavour. This is the conceptualisation of sustainable development used in this study. The literature review will now proceed to investigate the terms and applications of the values and principles of sustainable development as they are shown to apply in the field of housing production in the literature.

2.3 Sustainable Development and Housing Production

Sustainable development and housing production directly affect one another, as the conceptual framework of this study shows (see figure 1 on page 2). As Section 7.67 of the United Nations' Agenda 21 states:

The activities of the construction sector are vital to the achievement of the national socio-economic development goals of providing shelter, infrastructure and employment. However, they can be a major source of environmental damage through depletion of the natural resource base, degradation of fragile eco-zones, chemical pollution and the use of building materials harmful to human health. (UN, 2004)

Similarly, Asif *et al.* (2005) state that all over the world, construction contributes significantly to socio-economic development even as it makes significant use of natural resources and contributes significantly to the generation of greenhouse gasses. Brown and Bhatti (2003) highlight the importance of understanding housing and its impacts on sustainable development when they write: 'Research could usefully focus on the complex inter-relationships of the impact of housing policies and practices on broader societal goals such as sustainability and economic growth.' (Brown and Bhatti, 2003:513)

Although this study is only concerned with housing production, housing production is not the only stage of the building that is relevant to the advancement of sustainable development. In relation to the impacts that housing has on sustainable development, the lifecycle of buildings is often recognised as having three major stages:

1. The production stage, which includes all activity prior to occupancy of the building.
2. The building-in-use stage.
3. The decommissioning stage at the end of the building's useful life.

(Gerilla *et al.*, 2007; Abeysundara *et al.*, 2009; Ortiz-Rodriguez *et al.*, 2010; Monahan and Powell, 2011, among others).

Monahan and Powell (2011) present a clear flow chart that shows these life style stages graphically and also highlights the construction stage, which is the life cycle stage this PhD study focuses on. This flow chart is reproduced in figure 6 below.

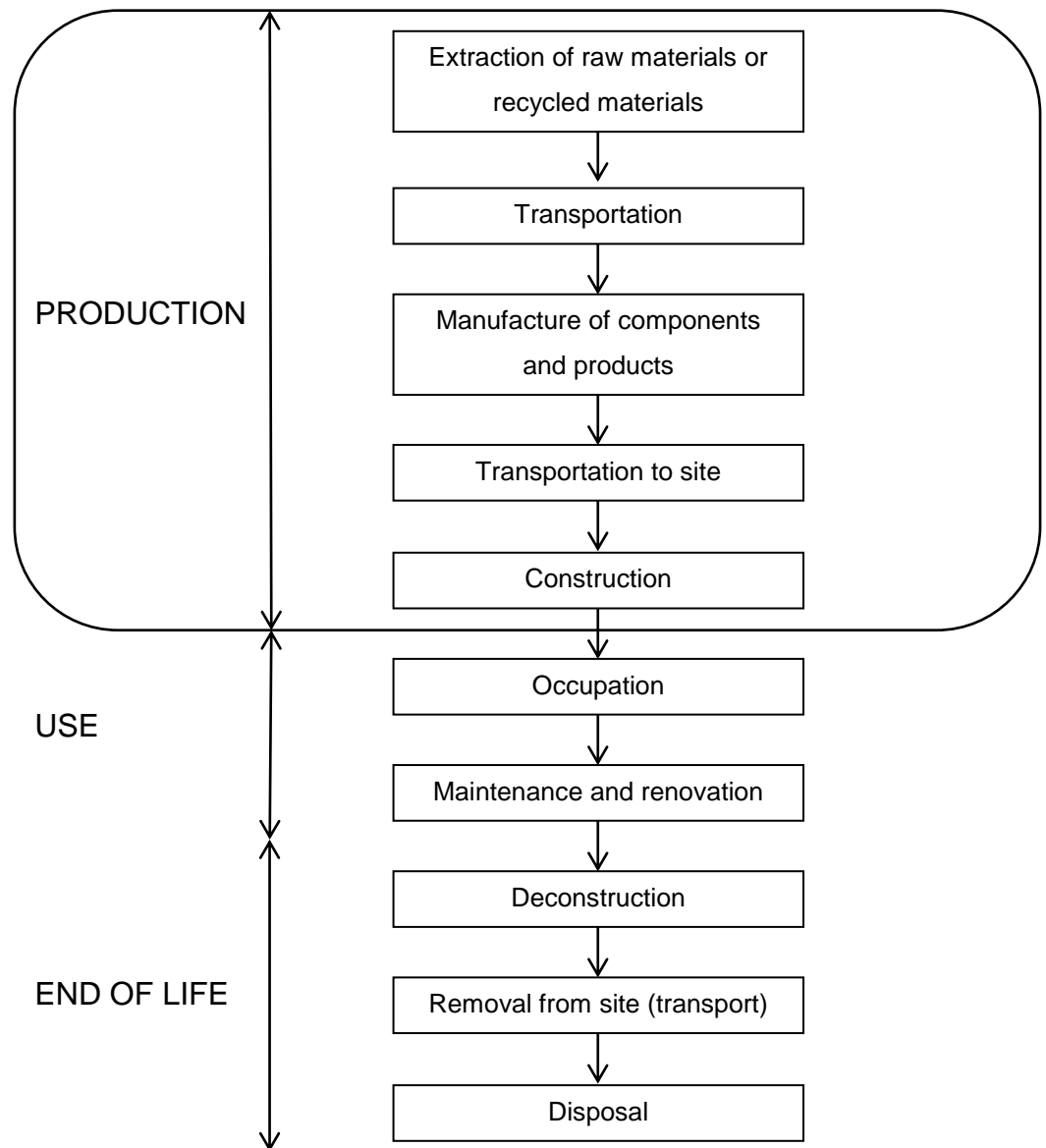


Figure 6: *A simplified lifecycle process flow chart showing the production stage*
 (Source: Monahan and Powell, 2011:183)

The present study focuses on the production stage because this is the stage in which choice of housing construction materials and methods is made. Furthermore, the materials and construction methods that are used in the construction affect all the other subsequent stages of the building’s life cycle, as Zhang and Canning (2011) and others rightly point out. As Harrison (2006) puts it:

The choice of materials for construction controls whole of life cycle impacts such as emissions, gross take, properties of wastes returned to the bio-geo-sphere, use of recycled wastes and their own recyclability. Materials also strongly influence lifetime energies, user comfort and durability. (Harrison, 2006:110)

It must be observed here that while there is some literature on the relationship between housing construction and economic development, the greater majority of sustainable development literature in the field of construction employs the sustainability discourse, with a resultant emphasis on environmental sustainability and the well-being of future generations. Sustainable housing, ecohousing and green construction are some of the widely used terms that clearly reveal this focus on the environmental impacts of housing construction. The impacts of housing construction on the economy and the well-being of present generations, by contrast, are treated much less.

For instance, Salè (1998) state that ‘architecture has come to be understood as an *intrinsically ecological* discipline’ (Salè, 1998:413, emphasis from original). Similarly, Parkin *et al.* (2003) discuss the United Kingdom government’s approach to sustainability and sustainable development in the construction industry at the macro level from the position that sustainability is the goal of sustainable development and therefore the goal of change in the construction industry. This relatively common conceptualization reduces ‘sustainable development’ to being synonymous with ‘construction projects that are sustainable’; essentially translating the word development into projects (rather than economic development) and thereby silencing the economic aspects of the problem. In this regard, Choguill (2007) holds that the commonly found operational definitions of sustainable housing that contain environmental approaches and do not include the meeting of needs are meaningless; they describe good housing rather than sustainable development in housing. To achieve sustainable development in housing, he argues, the surest guidance is to seek to meet current needs through economic development as a central guiding principle. The present study reviews both economic and environmental implications of housing construction materials and methods as it is presented in the literature.

2.3.1 What housing construction materials and methods mean for sustainable development

As has been discussed in the last section, sustainable development, as a theoretical concept, enables us to make the causal links between the materials and methods used for housing construction and their impacts on the economy and the environment. Sustainable development, as a normative concept, requires that the materials and building methods used for the construction of houses should employ human and natural capital in ways that advance economic development and support environmental sustainability.

Elizabeth and Cassandra (2005) explain that the concept of sustainable development enabled architects to perceive for the first time the relationship between their buildings and the health of the environment and the economy; it provided a means to understand ‘the effects of our building designs and materials choices on all beings now alive and their descendants’ (Elizabeth and Cassandra, 2005:9). Building structures, they explain, could now be viewed by industry practitioners ‘not as isolated entities but parts of and within interdependent systems’ (Elizabeth and Cassandra, 2005:4).

The construction and use of buildings has been described as one of the most environmentally unsustainable activities on earth on account of its resource use, energy use and pollution. Edwards (2002) holds that an estimated 50% of all resources used on earth go to construction, while Zimmermann *et al.* (2005) report that buildings, during construction and operation, consume 50% of the energy currently being used worldwide. Roaf *et al.* (2007) also report that contemporary buildings account for over 50% of all energy use in developed countries, are the source of more pollution than any other source, and contribute more than 50% of the gasses that are known to lead to climate change. Williamson *et al.* (2003) maintain that it is the duty of the industry actors to mitigate the excessive environmental damage that buildings currently inflict ‘because of the amount of raw materials, energy and capital they devour and the pollutants that they emit’ (Williamson *et al.*, 2003:3).

Steele (1997) and Roaf *et al.* (2007) describe the high pollution and high embodied energy of cement, metals, glass, plywood and bricks. Asif *et al.* (2005) conduct a study, at the individual house level, of the environmental impacts from eight different construction material components of an existing house in Scotland. They find that the total embodied energy of the three-bedroom house in their study is as high as

227GigaJoules, with concrete, timber and ceramic tiles having the highest negative environmental impact.

Griffiths *et al.* (2003) report on a study of the negative environmental impacts of buildings on an industry-wide scale carried out in the United Kingdom. The study analysed resource and material flows through the construction industry from extraction and processing, through use and disposal. Their findings show that over 424 million tonnes of materials were used in the UK construction industry in 1998 alone, including 60 million tonnes of waste generated during extraction and another 90 million tonnes of waste generated during construction and demolition; 28 million tonnes of greenhouse gasses were emitted, 90% of which was CO₂; and, the energy equivalent of 7.8 million tonnes of oil was used. All this represented only 273 million tonnes of net building stock added in that year, both as new build and maintenance. They point out that this is a high ratio of resource wastage to additions to building stock and hold that these findings demonstrate further the need for changes in resource and energy efficiency levels in the construction industry. European wide studies on drivers for resource consumption also show that new housing construction represents one of the main activities that impact on materials use and employment (Steger and Bleischwitz, 2011).

Other studies examine the links between construction materials and methods on the one hand and economic development on the other hand. Das (2006) reports on studies that confirm that retention has a positive impact factor on the economy of two times the value of the money retained, making retention an important tool in economic development. He finds that choice of construction technology impacts on both retention of money in the local economy and employment. Mehta and Bridwell (2005) discuss cost effectiveness, labour effectiveness and labour efficiency as important advantages of appropriate construction methods. Similarly, Tipple (1995) provides a detailed study of a number of ways in which increased housing construction using appropriate technology is good for local economic development, highlighting such advantages as job creation and rapid wealth creation from the multiplier effect of retention. Furthermore, Tipple (1994a) discusses the negative impacts on the economy from the use of imported or expensive materials and labour as well as from highly mechanized construction processes.

Horvath (2004) discusses the importance of the construction industry to the economy of the United States of America (U.S.). The study reports, for instance, that construction

directly contributed 8.4% of the U.S. gross domestic product in the year 2001 and directly employed 6.57million people in the year 2000. Horvath (2004) also points out that an all-inclusive approach to understanding economic and environmental impacts of construction, to include upstream and downstream processes, would produce much higher figures. The 2008 Strategy for Sustainable Construction for England recognizes the role that construction plays in the British economy and expects that employment opportunities and economic growth will result from new and innovative building materials and methods (Marvin, 2008). In a South African study, Dalgliesh *et al.* (1999) observe that the wealth and multiplier effect from housing construction that uses labour intensive methods is recognized as a crucial part of sustainable development in the South African National Housing Forum of 1994. Similarly, du Plessis (2005) holds that the building and construction sector has the potential to play the leading role in changing the poor economic fortunes of Africa without damage to her considerable environmental capital.

In essence, the literature shows that housing construction choices have direct and significant impacts on local economic development and global environmental sustainability. These impacts arise from the use of considerable amounts of human and natural capital for the activity of housing construction.

2.3.2 *What sustainable development means for housing construction materials and methods*

The perception by building professionals of the problems that buildings were creating on the environment and the economy, and the adoption of the principles of sustainable development as a means of understanding and dealing with them, represent a paradigm shift in architecture and other allied professions (Steele, 1997). Housing holds an important position in the discussion on sustainable buildings and sustainable construction because housing is the basic form of shelter all over the world, and is therefore arguably the most important component of the built environment (Marsh, 1997). The sustainable development paradigm means that it is now possible to understand and deal with the impacts that housing has on the economy and the environment.

Thomas Kuhn (1962) describes a paradigm shift as occurring when a profession is at risk of losing credibility for its contributions because of the serious problems facing the profession which it considers outside its domain, and which it does not possess the tools and techniques to tackle. He explains that when a new paradigm is presented that enables the profession deal with these problems, there follows a new way of seeing, accompanied by research and the development of new rules and methods of dealing with the problems, and resulting in changes in the problems that the profession recognizes, teaches and discusses (Kuhn, 1962). This process is clearly evident in the adoption of the sustainable development paradigm in the field of housing production.

In the face of evidence of environmental destruction and poverty resulting from building activities, the architecture profession adopted the new sustainable development paradigm as evidenced by the 1993 Declaration of Interdependence for a Sustainable Future of the International Union of Architects (UIA), which requires members to ‘Bring all existing and future elements of the built environment – in their design, production, use and eventual reuse – up to sustainable design standards’ (UIA, 1993). Elizabeth and Adams (2005) write about ‘a new construction era based on principles of ecological balance’ (Elizabeth and Adams, 2005:4), while Roaf *et al.* (2007) state that ‘Architecture is changing fast’ (Roaf *et al.*, 2007:318). Glass *et al.* (2008) write that the requirements of sustainable development indicate that ‘major changes are needed relating to materials, techniques, skills and innovation’ (Glass *et al.*, 2008:4534).

At the international policy level, the United Nations set up a Sustainable Building and Construction Forum in 2002 to promote sustainable construction, particularly in the developing world (UN, 2003). Agenda 21 of the Rio Conference on Environment and Development (UN, 2004) includes actively promoting sustainable construction activities by all countries as one of its programme areas to promote sustainable development. They make several proposals in this regard, including the stipulations that local inputs be used for indigenous building materials; that labour-intensive methods be employed; and that affordability of building materials be made a priority. In addition, Agenda 21 highlights the importance of changes to policy and practice in order to achieve these proposals and promote the use of these materials and methods.

Melchert (2007) reminds us that a sustainable development agenda is particularly important in developing countries because a large amount of construction activity is required in these countries in the near future, and the mistakes of degrading the environment and causing widespread poverty that the developed countries made should not be repeated.

Economic development techniques that were discussed in the literature for sustainable development in housing construction included the issues of cost, employment and retention. One of the most widely used mechanisms for promoting economic development in the literature on housing construction involved developing low cost building strategies. Some studies that highlight the importance of building materials and methods in producing cost-effective housing include Dash (1994), Olotuah (2002), Minke (2006) and in Nigeria, Ozo (1990). Tiwari (2004) and Mehta and Bridwell (2005) both include employment generation as one of their assessment criterion for studies in sustainable housing in a Third World context. Tipple (1994b) and (1995) develops the argument that changing to innovative, labour intensive and locally produced building materials and housing construction methods would have many positive impacts on economic development and would provide living space at a low unit price, in addition to supporting environmental sustainability. Along the same lines, Hill and Bowen (1997) include employment creation through labour intensive construction as one of their economic principles for sustainable construction.

Environmental sustainability techniques that support the goal of sustainable development through housing construction are discussed extensively in the literature. As Halliday (2008) writes: 'a vast and expanding variety of tools and techniques have emerged to promote, guide and appraise sustainable construction' (Halliday, 2008:44). Eco-architecture, bioclimatic design, green buildings, eco-sensitive buildings, energy efficient buildings and smart or intelligent buildings are some of the terms used to describe and define buildings that show environmental sustainability as their goal (Zhu and Lin, 2004). Both Olotuah (2002) and Goebel (2007) comment on the superior environmental qualities of local, natural materials, particularly earth, pointing out how well they are suited for their local climates.

Housing construction materials and methods are studied in relation to many different environmentally advantageous objectives, including the following:

- Energy reduction techniques, particularly fossil fuel energy, through changing to the use of low energy materials and methods (Dalglish *et al.*, 1997; Edwards, 2002; Thormark, 2006; Halliday, 2008) and changing to materials that improve the energy efficiency of buildings (Hyde, 2000; Roaf *et al.*, 2007).
- Conservation, reduction of waste and recycling of limited resources, including water, land and materials (Dalglish *et al.*, 1997; Koebel, 1999; Crown, 2000).
- The reduction or elimination of pollution (Treloar *et al.*, 2000; Smith, 2005; Minke, 2006; Gerilla *et al.*, 2007).

The authors listed above are by no means the exhaustive, nor the mutually exclusive, list of those that treat the different environmental issues, but represent the large number of contributors in all areas of environmental sustainability and housing construction. Hamza (2004) and others differentiate between embodied energy and operational energy. Embodied energy refers to the energy that is used during the manufacture of building material and the construction process; operational energy is used to refer to the energy used during the building occupation. Roaf *et al.* (2007) and others hold that embodied energy is far less than operational energy in housing because of heating needs.

However, Haggard *et al.* (2005) discuss ways in which architectural solutions can reduce the need for mechanical systems and imported energy to ventilate, heat, cool and light buildings. Similarly, Thormark (2006) points out that operational energy is reduced in energy efficient buildings through careful choice of materials, passive design, and renewable energy use, in which case embodied energy correspondingly becomes the dominant concern. The paper also discusses the importance of materials choice to end of building life issues such as disposal and recycling. In short, choice of housing construction materials and methods has impacts throughout the life-cycle of the building. A study by Hernandez and Kenny (2009) also focuses on the embodied energy from construction materials and methods rather than energy in use. They emphasize the fact that accounting for embodied energy is a crucial factor in the move towards sustainable development through zero energy buildings.

Treloar *et al.* (2000) discuss the pollutants to air, water and land, which occur at the preconstruction phase, from production of the components for construction; during construction; and at the post-construction stage, during use, maintenance, refurbishment and decommissioning of buildings. Gerilla *et al.* (2007) find that pollution from nitrogen oxides, sulphur oxides and suspended particle matter is much greater during the construction stage than during any other life-cycle stage of the houses in their study. The Japanese study also shows that steel reinforced house types are worse for the environment than wooden house types.

Gieseler *et al* (2004) and Roaf *et al* (2007) are among the authors who analyse the cost efficiency of energy efficient buildings, effectively combining the environmental and the economic domains. They find that construction costs are higher for energy efficient buildings, at the current state of technology. They both point out that this extra cost is eventually recovered during the building in use stage. Similarly, Vijayan and Kumar (2005) state of green building: 'It not only turns out as a cost-efficient alternative for the owner, but is also a boon to the national and global economy' (Vijayan and Kumar, 2005:131).

There is, indeed, a vast amount of literature on the ways that housing construction has been or should be altered as a result of the sustainable development paradigm. Nevertheless, it is possible to organise all of these studies under four headings – money, labour, materials and energy – that fully encompass the human capital (money and labour) and natural capital (materials and energy) used for housing production. Table 2 below summarises the implications of sustainable development for housing production given in the literature under these four headings. In the end, sustainable development requires that, during the construction of houses, human and natural capital be used in ways that increase their efficiency and mitigate impacts that negatively affect the environment and the economy, as table 2 below shows.

	<p>PROMOTE ECONOMIC DEVELOPMENT through careful use of human capital (Marvin, 2008; Choguill, 2007; Das, 2006; Elizabeth and Adams, 2005; du Plessis, 2005; Mehta and Bridwell, 2005; Hill and Bowen, 1997; Tipple, 1995; and many others.)</p>		<p>SUPPORT ENVIRONMENTAL SUSTAINABILITY through careful use of natural capital (Loh <i>et al.</i>, 2009; Halliday, 2008; Pulselli <i>et al.</i>, 2007; Roaf <i>et al.</i>, 2007; Gerilla <i>et al.</i>, 2007; Minke, 2006; Asif <i>et al.</i>, 2005; Hyde, 2000; Treloar <i>et al.</i>, 2000; and many others)</p>	
	Money	Labour	Materials	Energy
USE RESOURCES EFFICIENTLY	Increase cost effectiveness.	Increase labour efficiency.	Reduce waste.	Improve energy efficiency.
MITIGATE NEGATIVE IMPACTS	Retain money in the local economy.	Use labour intensive technologies.	Reduce pollution.	Avoid using fossil fuel energy.

Table 2: *What sustainable development means for housing production*

In summary, the literature shows that many of the materials and methods currently used for housing construction are wasteful and impact negatively on the economy and the environment. Sustainable development requires that we stop using such housing construction options and change to those construction materials and methods that make efficient use of human and natural capital and do not harm the economy or the environment.

From the literature, it can be seen that a great deal of action has been undertaken that is aimed at advancing sustainable development in the field of housing construction. Studies show that sustainable development requires, and has resulted in

- government policy and regulation designed to make sustainable development issues relevant in the field.
- innovation for changes to the materials and methods used for housing construction; and
- the means for appraising options in order to make informed construction choices.

Some of these studies are reviewed below.

2.3.3 *Steerage towards sustainable development through institutional action*

Meadowcroft (2000) discusses institutional changes arising from sustainable development through a survey of ten governments of industrialised countries. The study reveals four ways in which governments have changed their methods in response to the need to incorporate environmental management. These are given as ‘reform to structures and procedures of governance’ (Meadowcroft, 2000:374); the tendency to initiate more comprehensive strategy and planning processes (Meadowcroft, 2000:375); the effort to employ more systematic mechanisms for measuring environmental effects, and monitoring the impacts of policy (Meadowcroft, 2000:376); and changes with respect to the policy instruments invoked to secure environmental gains (Meadowcroft, 2000:377). In other words, governments could be argued to serve the role of upholding sustainable development values in the field.

It is perhaps to this that Swyngedouw (2010) refers when he argues that the decision to uphold sustainable development values was not democratically taken. Even if this is so, the relevance of this assertion is that as a stakeholder in the field, governments and other interest groups are theoretically synonymous with sustainable development since they uphold the goals and principles of sustainable development. The literature shows a number of instruments that government agencies use in this regard. These include policy, legislation and market instruments.

Tiwari (2004) investigates the way that policy behaviour can alter the level of achievement of sustainable development goals in India in the area of housing construction. The study concludes that policy instrument affects the choice of building

materials and can lead to the increased use of cost effective and energy efficient construction technology if used effectively.

Macoloo (1994) discussed the relationship between housing policy and the environment. The Kenyan study argued for the inclusion of environmental considerations into government housing policies. Koebel (1999) warns that the response by public policy makers to the need for a change to buildings that respond to economic and environmental is usually to create more building regulations, which, he holds, can be an impediment to innovation and change. However, Halliday (2008) reports that the progress so far in policy development aimed at promoting sustainable development in the design and production of buildings is having a positive impact, and is mainstreaming the once marginalised environmentally and community responsible practices. However, she asserts that a great deal more effort is required, particularly in the area of legislation.

Priemus (2005) found policy inadequacies in the sustainable development policy for housing in the Netherlands. His study of the national policy framework showed that the Dutch government had not clearly defined what sustainable housing is, how the sustainability of housing could be measured or what represented a zero measurement that would enable accurate evaluation and promotion of sustainable housing. Priemus (2005) points out that more knowledge is required to provide adequate understanding of all the factors and conditions involved in sustainable development as it relates to housing, and maintains that researchers could fill the gap of knowledge and policy through specifically targeted research.

Pett (2004) also refers to the lack of adequate legislation, in England and Wales in this case, that would make unsustainable housing illegal. Pett (2004) states that legislation is necessary to 'provide a code of conduct, describing the boundaries of acceptable behaviour, the minimum that must be done (prescription), or specifics that must not be done (proscription)' (Pett, 2004:239). The study by Pett (2004) of the regulatory and policy framework for sustainable housing in England and Wales reveals that the policy framework is better developed than the regulatory framework, so that unsustainable practices tend to be discouraged rather than proscribed. Similarly Beerepoot and Sunikka (2005) explain that the failure of the European Union policy to establish minimum standards with its mandatory energy certification scheme severely reduces the effectiveness of the scheme. Marcuse (1998) reminds us in this regard that

sustainability is a question of survival of the planet and the human race, and argues that the failure to satisfy any aspect of the short-, medium- or long-term sustainability constraints should be considered adequate reason to reject a line of action. These studies indicate that unsuitable housing construction options should not be permitted.

It is well known that legislation for housing construction often takes the form of building codes. Elizabeth and Adams (2005) review building codes and their impact on sustainable development in buildings. They report that changes and innovations in building materials and methods have occurred in response to the sustainable development paradigm, and argue that this generated a need for gaining building approval for these new types of buildings. They show that one of the broadest changes that have occurred in the area of building codes as a result of this dynamic is the introduction of the International Performance Code published by the International Code Council. The Performance Code presents regulations which are no longer based on prescriptive criteria but on outcome or performance criteria. Elizabeth and Adams (2005) explain that this type of reform is advantageous to the development of sustainable building materials and methods.

Makaka and Meyer (2006) also discuss the value of performance codes over prescriptive ones. They report that the building regulations that are used in most Third World countries are the prescriptive type, and this serves to inhibit innovation and the development of alternative low-cost building materials and construction methods. Moore and Rydin (2008) report from their study that building professionals express a preference for performance based rather than prescriptive building codes.

Choguill (2007) undertakes a study of sustainable housing in the Third World. Choguill (2007) holds that for housing policy to be sustainable, it must stem from an understanding of sustainable development which can then be applied to the field for the production of sustainable housing. The paper outlines a number of areas in which housing policies must be devised and implemented to meet the particular needs of developing regions. These include: access to good quality affordable building materials, which has both an economic and an environmental dimension; and improvement of building standards, to remove the constraints they place on finding suitable housing solutions. Choguill (2007) contends that rather than prescriptive requirements, only a few welfare standards are truly necessary.

In the United Kingdom, the *Code for Sustainable Homes* was released in 2007, with an updated version released in 2008. It is a mandatory environmental assessment method for new house construction. The drivers for producing this assessment are given as ‘climate change resulting from carbon dioxide emissions’ and ‘other environmental impacts ... such as water use, waste generation, and materials for building’ (Crown, 2008:3). The emphasis on environmental sustainability over other dimensions of sustainable development is obvious in this sustainable housing assessment method.

In this regard, Lovell (2004) traces the history of sustainable housing advocacy in the United Kingdom to the political activities of the green movement from the 1970s. The paper recounts how the shared value system of this group was expressed through their concern with lifestyle choices and its effects on sustainable housing production and use. However, the study reports that during the 1990s policy makers began reconceptualising sustainable housing in order to meet specific policy requirements. This group, she shows, employed modern ecological discourse to frame sustainable housing as a response to climate change and CO₂ emissions. The study refers to the promotion of low-carbon housing to define sustainable housing as the outcome of this discourse, and the *Code for Sustainable Homes*, under draft at the time, as the output of this discourse. This study supports the findings of Mebratu (2006), which showed that agendas rather than theory formed the basis of many widely used models of sustainable development. However, Lovell (2004) emphasises that sustainable housing is likely to be more successful when it is a product of a social process based on values, which achieve innovation and drive change, than as merely a technical solution to a specific issue. This conclusion points to the advancement of sustainable development through social means.

Zimmermann *et al.* (2005) recommend the establishment of limiting environmental benchmarks to define sustainable construction. They propose binding targets expressed as total energy use per m² and per year, in order to capture baseline construction and operational loadings. The method calculates the benchmarks based on political consensus. Lee and Yik (2004) as well as van Bueren and Heuvelhof (2005) advocate a combination of regulatory and voluntary policy frameworks as the best means of helping to ensure sustainable development in buildings. These include mandatory minimum standards enforced through regulation, such as codes, taxes or permits, in conjunction with the encouragement of voluntary performance standards, such as labelling schemes, to encourage the effort to rise above the minimum standard.

Similarly Beerepoot and Sunikka (2005) suggest combining information schemes, such as energy labelling of houses, with regulations or economic incentives to make them more effective in initiating change.

From this critical analysis of the literature, it can be seen that the function of institutional policy and other instruments is the steering of housing production towards change to more appropriate choices that support the goals of sustainable development. However, in Nigeria in general, and in the study area in particular, no overt sustainable development or sustainability studies are in operation in the field of housing production. Neither the National Housing Policy (FRN, 1991) nor any Akwa Ibom State housing policy provides for steering to advance sustainable development.

While steering upholds the guiding principles and values of sustainable development that determine the direction of change, it also employs processes that determine the outcome of change. These processes are grouped as

- innovation to produce or identify housing construction materials and methods that advance sustainable development; and
- the development of tools for appraising the sustainable development impacts of housing construction materials and methods for decision-making.

2.3.4 Technological innovation for sustainable development:

Technological innovation has always been considered as one of the most important action areas for advancing sustainable development. As Paredis (2011) puts it

The debate on sustainable development has always had a strong technological component. The development and diffusion of new and more technology, in particular environmentally sound technology, is regarded as one of the main pathways to simultaneously solving environmental and development problems. (Paredis, 2011:196)

The importance of technological innovation for achieving the desired changes in housing construction practices is widely recognised. Edwards (2002) is of the opinion that ‘Technology holds the key to architecture’s green future.’ (Edwards, 2002:83). Koebel (1999) expresses a similar view, positing that ‘Sustainability will not be “sustained” without advances in technology...- new materials, new products, and new processes...- and adoption of innovation in building’ (Koebel, 1999:76).

AtKisson (1999) and Brown and Vergragt (2008) also highlight the need for innovators and change agents in the urgent sustainable development effort.

Roaf *et al* (2007) report that innovation in building materials and the understanding of materials' impacts were the overriding concern during the 1990s in the field of housing construction and sustainable development. Halliday (2008) points out the value of innovation in discovering new materials or reworking old, to reduce embodied energy and pollution, while Thormark (2006) expects that technological solutions will also reduce operational energy needs in buildings. Nevertheless, it is important to note here that the innovations in construction materials and methods are generally referred to as 'alternative' (for instance, Mehta and Bridwell, 2005) or 'non-conventional' (for instance, Zhang and Canning, 2011), indicating that they are not widely used. Mehta and Bridwell (2005) define innovative or alternative technology as 'technology that has been creatively re-designed to produce a similar but better product' (Mehta and Bridwell, 2005:72). They report that innovative technologies are already being introduced that are capable of reducing cost while improving quality and environmental performance. In particular, they stress how important it is for the technology to respond to its local context.

In the literature, many examples are found of studies that analyse various technological innovations in building materials and methods for sustainable development. O'Brien and Hes (2008) report on the efficiency and low environmental impact of innovative light-weight construction technologies for housing construction in hot humid climates as compared to masonry construction in common use in Asia. Stultz (1988) offers a catalogue of appropriate construction materials, methods and equipment that promote sustainable development. These include earth construction technology, bamboo building and manual presses. Kuroshi (2007) reviews research efforts made in Nigeria in the field of sustainable materials and methods of construction, including new ways of stabilizing earth for use in housing construction.

Many examples of prototype housing from around the world that employ innovation in their construction are presented and analysed in the literature. These examples show improved sustainable development impacts as a result of the materials and methods used to create their building fabrics. Some of these include Roaf *et al.* (2007) which features 25 examples of 'EcoHouses' from around the world. The analysis includes a

description of their construction technologies as well as their low CO₂ emissions and environmental and cost summaries. Roaf *et al.* (2007) write:

Building materials require processing before they are incorporated into a building; this invariably requires the use of energy and results in waste generation. The choice of materials therefore affects the environmental impact of a building. The processing may be minimal, as in the case of a traditional cottage constructed from materials found locally, or it may be extensive, as in the case of prefabricated construction.

(Roaf *et al.*, 2007:48)

Chavez (2006) analysed an innovative construction method used to build a prototype of a sustainable house in Mexico, using panels made of recycle bottles. Based on the number of bottles used for the house and the number of empty bottles produced in Mexico annually, the study found that 1.8 million housing units could be built each year using this construction method. The paper concludes that the potential benefits that can be achieved from this innovation include reduced production costs, reduction in housing deficits, improved indoor temperatures comfort, and enhancement of quality of life and the economy.

Other authors investigate the sustainability of indigenous house types in different parts of the world. Taha (2005), Matthews (2000), Schwerdtfeger (1984) and Ogu (1994) all present studies examining different aspects of the sustainability of vernacular housing in Sudan, India and northern and southern Nigeria respectively. While Mathews (2000) and Schwerdtfeger (1984) discuss the superior thermal performance of traditional house forms and materials, Ogu (1994) and Taha (2005) were concerned with understanding the value of these houses in order to adopt their sustainability principles for modern use, to improve the quality of the built environment and raise the standard of living. Taha (2005) and many others conclude that traditional forms provide good examples of sustainable architecture.

However, Murison and Lea (1978) are among the authors who observe the dissatisfaction of people across the world with vernacular building types today. Oliver (1997) describes two forms this dissatisfaction takes: either the negative perception of vernacular buildings as the backward systems of primitive societies which need to be done away with in this modern era; or the more positive perception of them as the basis for making choices for developing modern day construction materials and methods grounded in tested sustainable practices.

The literature thus shows the importance of innovation as a means of developing appropriate housing construction materials and methods that use resources efficiently without impacting negatively on the economy or the environment, and the progress made so far in this regard.

2.3.5 Assessing sustainable development impacts

The assessment of sustainable development impacts from buildings is given as an action area that provides the means for making informed decisions. Many authors support the belief that these decision support tools and systems should be multi-dimensional, to reflect the many factors or parameters that affect sustainable development in buildings (Kuik, 1991; Priemus, 2005). Cole (1998) and Treloar *et al* (2000) assert that the life-cycle assessment method has been found to be the best method for reviewing all of the impacts from a building. Similarly, Elizabeth and Adams (2005) report that the life cycle approach is currently the most popular approach for ascertaining the impact of building materials. According to Curran (1996) and Halliday (2008), life cycle assessment methods are able to capture all the impacts of a building during extraction, manufacture, transportation, construction, use and decommissioning. Edwards (2002) also highlights its value for capturing complex environmental impacts from a building: 'LCA identifies the material, energy and waste flows associated with a building over its entire life in such a fashion that the environmental impacts can be assessed in advance' (Edwards, 2002:53).

Edwards (2002) states that 'Buildings have predictable performance, with inputs and outputs readily measured' (Edwards, 2002:2). Sustainable development assessment methods aim to measure these inputs and outputs. The literature contains a number of methods for assessing the sustainable development performance of building fabrics. These can be divided into two categories: those assessment methods that have been widely adopted and are in use at national and international scales; and those that have been suggested by researchers. According to Vijayan and Kumar (2005), the certification from the widely adopted assessments methods contribute to the sustainable development effort by increasing awareness and creating incentives for appropriate construction.

Both Bartlett and Guthrie (2005) and Todd *et al* (2001) undertake an analysis of the most used country-wide assessment methods, including the Building Research Establishment Environmental Assessment Method, BREEAM, used in the UK as well as in other countries and the Leadership in Energy and Environmental Design, LEED, used in the United States of America and Canada. The two studies both find that, in terms of the criteria used for assessment, all of the assessment methods reviewed concentrate unjustifiably on environmental issues and do not treat economic issues. This finding is also confirmed by the review of all major assessment methods from North America, Europe and Asia undertaken by Bunz *et al* (2006). Brown and Vergragt (2008) hold that these kinds of inadequate tools could eventually prove to be impediments to the achievement of sustainable development.

Similarly, Cole (2005) finds that the assessment methods widely employed by governments and third parties are usually concerned with the 'green' performance of buildings. Cole (2005) holds that since in developing countries socio-economic development issues tend to be more of a priority than environmental problems, the assessment of buildings should be able to reflect this priority. The study concludes that many of the assessment methods in current use, and which are being adopted in developing countries, are not generic, not standardized and not versatile enough for use in other contexts and may therefore not stand the test of time. In addition to the shortcomings in content, Cole (2005) also draws attention to the fact that the assessment methods take the form of market-place instruments, rather than requirements for building approval. Martens (2006) asserts that the issues that sustainable development deals with are as a result of systemic faults of imbalances in the society rather than market faults, and the market cannot correct them.

This discussion indicates three important problems with the national and international level assessment tools in current use. Firstly, the widely used assessment tools do not enable the assessment of the impacts that housing production has on the economy. This can be attributed to the dominance of the sustainability discourse in the field of housing construction. Secondly, these assessment tools are not objective enough to be used globally. This second problem can be seen to result from the focus on a given agenda, as Mebratu, (2006) as well as Lovell (2004) demonstrate, rather than on sustainable development theory *per se*. The specific agenda of the context where the assessment tool is developed means that the assessment tool will only be relevant to that context rather than theoretically valid in all contexts. The third problem with these current

assessment methods is that although they enable the measurement of impacts from buildings, they do not provide limiting standards for judging when an option is unacceptable. As Cole (2005) reminds us, these standards are necessary for building approval. Thus these assessment methods in common use are recognised as being inadequate in very fundamental ways for the purpose of making informed choices of housing construction materials and methods that can advance sustainable development.

The second group of assessment methods found in the literature is those proposed by researchers. Dincer and Rosen (2007) and Mwashu *et al.* (2011) highlight the importance of energy and resource assessment of a building's fabric to understanding its effect on sustainable development. While it is correct to say that understanding these environmental impacts is of critical importance, this critical review of the literature reveals that assessing labour and money use are just as important to achieving an accurate picture of the impact of any building on sustainable development.

Hovarth (2004) writes, concerning materials flow analysis in construction, 'Materials flows signify the magnitude of renewable and nonrenewable materials production and consumption, the energy needed to extract, transport, and prepare them for further use, the corresponding emissions and wastes, and the potential for depletion of viable stocks.' The study argues that materials flows do not adequately capture all impacts and advocates the inclusion of all environmental and economic impacts across the entire supply chain, including upstream and downstream activities that are not directly construction activities. The paper gives many examples of such indirect activities, include banking, advertising, legal services and eating and drinking that take place during the production of housing.

Das (2006) provides an example of an assessment method that addresses both environmental and economic impacts. The study undertakes a comparative examination of different construction technologies used in a series of government projects in rural India, to assess their sustainability. This resulted in the provision of an assessment methodology for determining the performance of materials, methods of construction and manpower used in building projects in relation to both human development needs and environmental impact, in order to enable informed choices to be made in the future.

Pulselli *et al* (2007) and Pulselli *et al* (2009) serve as an example of an energy and resource assessment method proposed by a researcher that is generic and versatile for use in all contexts and all building types. The authors describe the method as global and

integrated. The papers demonstrate an accurate and simple method for the environmental assessment of buildings using an analysis of emergy flows. Pulselli *et al.* (2007) point out that emerging innovative technologies require a clear and comprehensive tool for establishing their level of efficiency of energy and material flows, and to ensure that they employ natural processes, use renewable and local materials, impact minimally on natural systems and cycles and fit into their context effectively.

Emergy analysis, as these authors describe, is an environmental accounting method that uses an energy system language to quantify and analyse all natural resources used throughout the life cycle. Emergy analysis is defined here as a calculation of the impacts from all energy and materials flows in the building. Emergy (spelt with an 'm') is defined as 'the available solar energy previously used, directly or indirectly, in order to make a service or product' (Pulselli *et al.*, 2007:62). Solar energy thus becomes the common denominator for all measurements. The unit for emergy is the solar emergy joule or sej. Specific emergy can be calculated for different processes, which is the measure of the emergy required to produce 1 joule or 1 kilogramme of a service or product (sej/J or sej/kg). The solar emergy of any given energy or material flow can then be found by multiplying the volume (in J or kg) by the established specific emergy.

Emergy analysis is used to evaluate energy and materials flows for building production, building maintenance and building use, building decommissioning, or any combination of these.

- i.) For building production analysis, an inventory of materials, manpower and other environmental issues such as soil erosion is used to evaluate the total emergy investment required for a given production process.
- ii.) For building maintenance analysis, the total emergy cost of replacing and repairing building elements that run out or deteriorate is found over the lifetime of the building or relative to a fixed period of the building's life.
- iii.) For building use analysis, the total emergy expended is derived from information on electricity, natural gas and water consumption as well as for solar irradiation which captures the renewable energy factor. The emergy cost of non-consumables in service provision, such as water pipes, is also included.

They also point out that emergy analysis can be used to set standards. The results, they show, are useful for a number of purposes. They can be easily converted into emergy

indices such as the building energy per m² or per m³ of enclosed space, per unit of local or any currency or per building inhabitant. The method allows for options to be comparatively assessed prior to construction and can also stand alone where no comparisons are required. It makes use of only quantitative data and is concerned only with environmental impacts. The energy analysis method is notable, however, for its simplicity, clarity, versatility and the full range of energy impacts it captures.

Energy analysis is important to this study because it provides an example of a tool for informing choice that is simple, objective, theoretically relevant and versatile. However, it is still lacking in a holistic view of both the economic and the environmental domains of housing construction that affect sustainable development.

The review so far has shown sustainable development to be a clear requirement to change the housing construction materials and methods we use in order to ensure that the activity of housing construction safeguards human welfare by promoting economic development and supporting environmental sustainability. The review has also shown that a great deal of action has been undertaken already in a range of areas including:

- steering by institutions, including government agencies, to make the advancement of sustainable development relevant in the field of housing construction;
- technological innovation for new housing construction materials and methods that promote economic development and support environmental sustainability; and
- the development of a range of tools for assessing the impacts of housing construction options on the local economy and on the global environment.

In short, much of the literature is aimed at providing information to support the needed change to housing construction technologies that advance the twin goals of environmental sustainability and economic development. However, there is also a growing literature that makes it clear that developing this kind of technical knowledge may not be all that is needed to secure the goals of sustainable development. Steele (1997) reminds us that there are two parts to the problem – ‘what we can learn and how we can use it’ (Steele, 1997:xi) and Koebel (1999), in the same regard, stresses that ‘engineering is only half the solution’ (Koebel, 1999:93).

Meadowcroft (2000), as well as Dresner (2002) express concern over the fact that although significant effort has been made at the policy and practice level in the name of sustainable development, little actual change in the field has been recorded. They point out that the expected change in the standard of living in developing countries has not been forthcoming, and that the earth's fragile ecosystems still remain in peril. Halliday (2008) also notes that action in the field of construction has not kept pace with sustainable development rhetoric. Brown and Bhatti (2003) write on the slow response of UK housing developers and the housing construction industry to the environmental agenda. Rid and Profeta (2011) also report on the low level of adoption of sustainable housing in the field, with the market share of sustainable housing across Europe remaining at well below 10% in spite of technological advances in the field of sustainable housing.

Similarly, a study by Da Silva and Ruwanpura (2009), investigating the frequency of LEED points scored on construction projects in Canada, found that the lowest points over all the projects studied were in the categories of energy and atmosphere and materials and resources. Zhu *et al* (2004) and Tiwari (2004) both observe that in the action arena, the desired change has not occurred to any significant degree, more so in developing countries where both poverty and harmful environmental practices are still prevalent.

To recap the discussion so far, the study of sustainable development and its application in the field of housing production has provided comprehensive information and understanding from the literature about how the materials and methods we use for housing construction can have detrimental effects on human welfare. The literature review has shown that sustainable development steering has become the role of government institution, the aim of which is to make the values, principles and objectives of sustainable development relevant in the field of housing production through such instruments as policy and legislation. The processes that have been discussed in the literature with regard to advancing sustainable development in the field of housing production include technological innovation and the technical assessment of sustainable development impacts from housing.

Together, it is expected that these sustainable development values and processes will result in fundamental changes in the construction materials and methods used for the production of housing. However, the literature also contains evidence that this change

has not occurred as expected. Based on the large amount of detailed technical knowledge available on the change needed to the materials and methods we use for construction and the failure of such change to occur to a significant extent, there are authors who look to the behaviour of stakeholders in the field for an explanation of why expected changes have not become widespread.

2.4 Stakeholders in the Field of Housing Production

This section reviews the literature highlighting stakeholders and the role they play in changing to construction materials and methods that support the goals of sustainable development. The literature contains a number of studies that interrogate stakeholder behaviour as a crucial issue in advancing sustainable development in the field of housing construction.

Jørgensen *et al.* (2009) discuss a view of technological innovation and adoption that focuses, for understanding technological change, on the actors; the choices they make, the strategies they adopt and, in particular, the socio-technical learning they undergo. This approach, they state, ‘seeks to draw the understanding of technology into the realm of social influence’ (Jørgensen *et al.*, 2009:82). This, they show, is in contrast to the deterministic technology push or market pull view often found in policy that sees technological innovation itself as the driver for change. Their view does not see the technological and the social as separate, but rather as co-shaping each other. This view is reflected by Paredis (2011) when he writes ‘society and technology co-evolve and mutually influence each other’ (Paredis, 2011:202). Jørgensen *et al.* (2009) hold that this social shaping approach to understanding technology development and adoption is particularly useful to sustainable development, since sustainable development is a field of study in which technological innovation and its application in society are based on multiple visions, conflicting interests and unfolding markets. The study provides empirical evidence of changes to stakeholder behaviour through deep learning among building practitioners as a result of a project on green technology innovation in Denmark.

Paredis (2011) also discusses the effect of technology on stakeholder behaviour, arguing that society is not necessarily in control of technological development as is the common view. Like Jørgensen *et al.* (2009), Paradis (2011) stresses the importance of the social and the nature of the relationship between the social and the technical. Both of these authors hold that the social and the technical are not independent of each other, a view also expressed in Sachs (1999).

From the co-evolutionary perspective, socio-cultural forms evolve in interaction with technical forms, just as technical forms evolve in interaction with sociocultural forms. (Sachs, 1999:185)

Indeed, a growing literature over the years shows that different aspects of stakeholders' behaviour has become recognised as being as crucial to the advancement of sustainable development as the technical aspects. Salè (1998) highlights the vital role of the architect, as designer, for ensuring that the materials and methods chosen for construction advance sustainable development. The paper advocates training and re-education of professionals and tradesmen in the construction industry as the most important factor in this regard, because he argues that profit seeking and ignorance have led to continued detrimental practices in the field of construction. The paper equally advocates the development of legal definitions describing the ecological performance of materials options and to support the claims of producers regarding the sustainability of their products. Salè (1998) concludes that architects should take responsibility for ensuring that the materials and technologies that are used for construction support sustainable development efforts.

However, Marsh (2011) sounds a warning in this regard. Marsh (2011) points out that the strengthening sustainable development ideology in the field of housing production theoretically reduces the function of design. According to Marsh (2011) it defines the role of architectural design as a predominantly technological function of 'the straightforward assembly of more or less efficient construction materials' aimed at satisfying the requirements of the ideology. Marsh (2011) argues that architectural design has a wider role to play than that defined in the sustainability discourse.

Koebel (1999) presents an analysis of the social process by which innovation becomes widely used in the American housing construction industry. The author believes this is important because he holds that developing engineering innovation of products and processes is not sufficient; an understanding of the social systems by which innovation

becomes diffused and adopted is also key. Koebel (1999) asserts that adopting innovation is a social process ‘shaped by social networks and systems’ (Koebel, 1999:77). The study shows that the adoption of innovation is not immediately universal, but takes the classical S-curve. That is, the adoption of innovation is begun by a few innovators who then judge the innovation and communicate their experiences to others; it is then taken up by the larger segment of society with a minority still trailing at the end.

Koebel (1999) explains that it is crucial to understand the basis on which people’s judgement about the performance of the innovation is made. The paper lists the social factors that were found to affect the adoption of innovative technologies as: relative advantage to the various stakeholders over the old technologies; compatibility with lifestyle needs; complexity of the solution, which is a disadvantage; trialability which is particularly important for housing because of the high cost, and which prototypes are used for; observability; and timing. He also highlights the impact of the degree of freedom of choice on the decision to adopt innovation. Koebel (1999) reports that building practitioners state that user requirement and demand is the strongest factor hampering the adoption of innovation. The paper concludes that since innovation and change in construction are essential to sustainable development, the importance of understanding the operation of the housing construction social system cannot be overemphasized.

Koebel (1999) identifies the three stakeholder groups in the housing construction social system as: policy makers; building practitioners; and the end users of the buildings. He gives the various positions of each group in relation to the adoption of innovation in housing as:

- A. The policy makers, who have the ability to regulate, and can make an innovation forbidden, encouraged or even compulsory;
- B. The building practitioners, who are concerned with efficiency and quality as well as profitability; and,
- C. The users of the building, who are concerned with both their own and other people’s perceived functionality of the innovation.

Guy and Shove (2000) interrogate the problem of the uptake of energy efficient buildings. They also argue that the actors and their requirements, the inter-relationships between them and the way problems and solutions are framed is more relevant in this regard than the technological barriers to broad-scale uptake.

Courtney (2001) focuses on how organisations use decision support systems, particularly with the new and complex requirements of sustainable development in decision-making. This paper calls for a new paradigm that requires not only the technical perspective but the social perspective as well, of decision-making. This includes stakeholders and results in 'perspective synthesis' of technical, organisational and personal perspectives which, the paper states, are interdependent. The paper concludes by looking forward to new developments in this regard.

Ngowi (2001) observes that advances in policy initiatives have not brought about widespread adoption of technological changes. Based on a study of energy-efficient housing in Botswana, the study highlights the competitive advantage that can be gained by practitioners who apply sustainable development principles from the early stages of their building projects. The study stated that competitive advantage is the most important value for construction practitioners.

Priemus (2005) interrogates the issue of innovation adoption at the institutional and the practitioner level in a behavioural study conducted in Holland. In this case, the study points to the decision-making processes of relevant building professionals as one of the likely causes of the failure to realise sustainable development in housing. The paper recommends 'a thorough consideration of all aspects of the decision making stage' (Priemus, 2005:14).

Lorenz *et al.* (2005) conduct an Eastern/Central European study on the need to advance sustainable development in the anticipation of rapid housing construction resulting from housing need. The study lists the stakeholders as policy-makers, practitioners and civil society, which is similar to the stakeholders identified by Koebel (1999). Lorenz *et al.* (2005) highlight the need to integrate all of these stakeholders for the successful advancement of sustainable development in this region.

Similarly, Kaatz *et al.* (2005) approach the problem of attaining sustainable development in construction through effective stakeholder participation. The distinction is made here between building as product and building as process, and the paper argues

that viewing building as process brings the participation of stakeholders to the fore. The authors take the position that stakeholder participation can only be effective when their needs, interests, views and values are integrated into decision-making of the construction project. This study explores an alternative use for assessment tools; not just to inform choice as it is commonly used, but rather to boost the participation of stakeholders in the process of sustainable construction delivery. Kaatz *et al.* (2005) report that fragmentation and complexity of the building industry are the main barriers to the advancement of sustainable development. They advocate integrating project and stakeholder objectives from the inception of a project, using building assessment tools.

Sahota and Jeffrey (2005) express the importance of looking beyond the technical aspects of advancing sustainable development. The study investigates the barriers to and drivers for the effective use of sustainability assessment tools. The social science investigation of organisations highlights stakeholders' agenda for using these decision support tools. The study findings and conclusions led to suggestions for improvements in these technical tools to make them more usable. This conclusion is significant because it is an instance of a technical aspect required to evolve as a result of improved behavioural understandings.

Martens (2006) proposes an integrated approach to research on sustainable development. The study calls for a shift from supply-driven approaches to demand-driven approaches to promoting sustainable development, based on an understanding of the actors, as one of the ways of making sustainable development operational. This is similar to the views expressed by Jørgensen *et al* (2009), who argue that neither supply nor demand issues alone are adequate to advance sustainable development through innovation in housing construction materials and methods.

Bossink (2007) also looks to the behaviour of stakeholders to explain adoption of innovation in housing construction. The paper analyses successful cooperative innovation activities between government organizations and building practitioners in several Dutch sustainable housing construction projects. The study investigates the social interactions and cooperation between the organizations which enabled innovation. Bossink (2007) models the inter-organizational behaviour and shows that success was achieved through a series of social interactions and interactive process between the organizations.

Melchert (2007) reviews the success of the Dutch sustainable policy development by looking at evolution in the behaviour of stakeholders from the 1970s, when sustainable development issues were first considered in construction, until the present. The historical review attributes the success of sustainability policy in the Netherlands to government's change in their approach from seeing industry participants as targets of their sustainability policy to seeing them as partners. Melchert (2007) shows that this change produced an equivalent change in the practitioners; they responded by being proactive in incorporating sustainability requirements into their buildings. The paper advocates this kind of consensual and negotiating approach for developing countries where, the paper reports, sustainable development policies are still nascent.

The study identifies the relevant stakeholder groups as the civil society, the industry practitioners and the government. Melchert (2007) indicates that the role of the government is to place sustainable development issues on the agenda and guide the direction of change; the role of implementing the sustainable development agenda belongs to the other two groups, the users and the practitioners. This study argues that an important reason for the success of the Dutch sustainable housing policy is that it evolved in a way that supported stakeholders' values. The paper argues that it is important, when spreading innovation, to avoid requiring fundamental changes to social dynamics.

Williams and Dair (2007) report on a qualitative study in which they approached stakeholders in the field directly, in order to understand why there was insufficient progress in sustainable building in England. They too identify regulatory agencies, practitioners in the field and end users as the three stakeholder levels. They analyse data from interviews with active stakeholder groups in five residential estates around the country as well as from documents from these projects. Their data analysis shows the frequency with which twelve barriers that make stakeholders not act sustainably were recorded in their data. Many of these barriers relate to operational or practical difficulties, such as site conditions, regulatory restrictions or the lack of suitable sustainable options. However, the study reports that by far the most frequently reported explanation for failure to adopt a sustainability measure was because the stakeholder simply did not consider it. Lack of awareness of sustainable alternatives was recorded as the least frequent cause. Williams and Dair (2007) conclude that

- i.) professionals require more training and professional development in sustainability issues;
- ii.) tighter regulations are needed to enforce sustainable options; and
- iii.) demand for sustainable buildings needs to be stimulated through reduced costs and reduced risks to practitioners.

Williams and Dair (2007) report that there is little or no demand for sustainable buildings from end users.

Brown and Vergragt (2008) also investigate the slow diffusion of sustainability innovation in housing, centring their investigation on the social learning processes among practitioners during an energy-efficient housing project in Boston. The authors argued that without changes to stakeholders' norms, belief systems and even lifestyles, rapid innovation diffusion will not be achieved. In conclusion, they support a process of 'higher learning', which promotes changes in 'the assumptions, norms and interpretive frames' that inform decision-making (Brown and Vergragt, 2008:110) through feedback loops and reflexivity. The study, however, also states that deeply held values are very stable and therefore do not change. This statement seems to contradict its own conclusions, or at least imply that it will be indeed difficult for sustainable development innovations to be rapidly adopted.

Moore and Rydin (2008) also identify the two different approaches to advancing sustainable development: encouraging technology shifts or encouraging behavioural shifts. They investigate the two different approaches and the distinct policy and research networks in Europe and the United Kingdom that adopt them. They highlight the problem of lack of coordination between these approaches at the institutional level, arguing that this split in knowledge and action orientations hampers the achievement of sustainable development goals. The study finds that at the institutional level in Europe and Britain, 'knowledge brokers and spanners' between the technological and the social approaches are needed in order for sustainable development to advance.

Menzel and Wiek (2009) conduct a small study in the United Kingdom aimed at challenging the veracity of willingness to pay as an indicator of choice behaviour. The study is based on the assumption that the majority of members of the public have a deontological value orientation that influences their choice behaviour. This study reflects a body of work reviewing environmental value systems undertaken in areas where strong sustainability regimes have entered the public psyche for some time.

Menzel and Wiek (2009), like Wesley Schultz (2001), ascribe a new value form to the notion of a growing public value for the good of the environment. While Menzel and Wiek (2009) describe this value as deontology, Wesley Schultz (2001) describes it as ‘biospheric environmental concern.’ In both cases, they distinguish this value from the widely known egoistic and altruistic nature of people.

However, Stern and Dietz (1994) analyse this notion of environmental values at the conceptual level and show that these values are a typical form of social altruism. Furthermore, they explain that such value change is a result of the framing by active environmentalist movements in these areas. Stern *et al.* (1999) offer a theoretical model to explain the observed value change caused by environmentalism and other social movements, and the resultant change in people’s attitudes and behaviour that has been witnessed. They call this value-belief-norm theory, which describes a process where:

- First, members of the public adopt the altruistic values being presented by activists of the movement.
- This adoption leads them to believe that, by their actions, they can restore the value that they have adopted (in this case, the good of the environment)
- This, in turn, produces personal norms or obligations to act, including willingly accepting sacrifices and behaviour regulations.



Figure 7: *Linear VBN behaviour model developed by Stern et al. (1999)*

Stern *et al.* (1999) then show that although there is a personal obligation to act, the form action takes is mediated by capabilities and constraints.

This ‘value-belief-norm’ theoretical behaviour model leads Stern (2000) to discuss strategies for changing behaviour that impacts on the environment through four types of interventions: appealing to values, which the study states as being unsuccessful so far; providing education and information, which they also give as having proved ineffective; using incentives to alter behaviour; and creating new norms of behaviour at the community level. Again, they point out that neither of the latter two strategies has

brought about behavioural change. Stern (2000) therefore advocates combining these strategies as the most effective means of achieving behavioural change. The value-belief-norm model, based on changes to values, attitudes and behaviour, was well received in the literature.

These studies in environmental value are important to the present research for a number of reasons. Firstly, they introduce the notion of inherent choice mechanisms, defined here as the values and choice processes that determined choice of housing construction materials and methods prior to the relatively new environmental activism which is reported as having exerted influences on people's values and behaviour. The notion of inherent choice determinants indicates an alternative starting point for investigating and analysing choice behaviour in the field.

The second reason these studies are relevant is because they identify a conceptual flaw in the logic of research in the field of environmental value. The value-belief-norm model of behaviour explains personal obligations to act as deriving directly from adopting a value and recognising the relationship between one's actions and restoring the value. But a person may think it important for a restaurant to be clean without picking up a mop to wipe up a spill made while he is eating there, even though he is aware that this action would restore his value for a clean establishment. Theoretically, this illustration means that value and belief do not necessarily lead to obligation and the value-belief-norm model is not justified.

A third relevance of these studies is that they provide an example of choice engineering based on choice modelling. Interestingly, the behaviour change strategies suggested by the value-belief-norm behaviour model have all been shown by Stern (2000) to be unsuccessful, which should have provided the indication that the model itself was faulty.

Finally, there is a compelling case for arguing that environmental deontology/biospheric environmental concern/social altruistic value systems are not the values determining the choice behaviour of the public in the field of housing production. If they were, choice outcomes among housing users and housing practitioners would be for sustainable options. The evidence is, of course, the widely reported failure of stakeholders to adopt sustainable housing construction technologies on a large scale, even in those areas where strong sustainability movements operate. Based on these reports, we can safely say that choice of housing construction materials and methods in the field is not based

on environmental values. What is it based on? The present research holds that accurate modelling of inherent choice values and processes, and how sustainable development is related to these inherent mechanisms, is the most suitable basis for identifying effective strategies of choice change to advance the goals of environmental sustainability and economic development.

Hay (2010) also comments on the inadequacy of sustainability achievements so far recorded. This study examines the problem at the individual and leadership levels. Its focus is on values. The paper identified the root cause of unsustainable living to be people's dominant anthropocentric and utilitarian personal identity, based on egocentric values, which, the author states, is incompatible with sustainability. Hay (2010) held that this egocentricity created what he referred to as 'a shallow technology approach' that does not encourage or require any significant changes in our ways, supporting instead 'a technological fix' (Hay, 2010:164). Hay argued that people need to change their values to "ecocentric" values, which would recognize wider links to society and place and therefore support service to society and transformational leadership. This argument is contrary to that presented by Melchert (2007) which advocates that strategies to advance sustainable development in the field should involve minimal value change.

Crabtree and Hes (2009) conduct a study in Australia aimed at understanding the institutional barriers and drivers to the uptake of sustainable technologies in housing developments. They cite the earlier works of Mosler (1993) and Perrings (1998), and like them take the position that sustainable technologies are available but there are social barriers to their widespread use by stakeholders in the field. The study identifies the primary stakeholders in the Australian building industry as housing developers, builders and home buyers. The study carries out surveys are made with 100 home buyers as well as 300 members of the general public visiting a specific housing show. They also undertake surveys from 35 builders and 12 developers as well as iterative interviews with some of the developers. This produces both quantitative and qualitative data. The study looks at the intention of the respondents to purchase renewable timber, rainwater tanks and solar panels, all known technologies that improve the environmental impacts of houses. The findings are analysed using the theoretical realm of stated preference in rational choice theory. It also looks at what factors respondents give as reducing their willingness or ability to use sustainable housing technologies and how

the effect of these factors may be minimized. The results of the study are presented using the identified stakeholder structure of housing users, builders and developers.

Crabtree and Hes (2009) find that home buyers interest in sustainable technologies is not directly linked to any environmental concerns. They therefore conclude that health, comfort and other such factors are more relevant, and that environmental features should not be the primary selling feature of the house. They also report good levels of awareness about innovative sustainable technologies but uncertainty around home buyer's willingness to pay more in order to acquire and use them. They describe sustainable housing technologies as being 'too expensive to be readily adaptable', and conclude that this indicates a need for improved pricing mechanisms.

Among the builders, the findings show a high level of interest in using sustainable technologies, with legislation and consumer demand being given as the primary drivers. The primary barriers they identify among the builders are lack of skills and buck-passing, highlighting the need for education and training as well as responsibility. The study reports that interview participants all expressed the need for, among other things, proper legislation, appropriate sustainability standards to be set and the dissemination of information in addition to funding for large scale adoption of sustainable technologies. Crabtree and Hes (2009) conclude by stating that institutional rather than technological barriers are responsible for the failure of housing to become more sustainable, and they state that advancing sustainable development through the uptake of appropriate housing technologies will require 'better thinking' and 'the need to engage the public imagination' (Crabtree and Hes, 2009:223).

This study is important for a number of reasons. Firstly, it shows a desire to understand the position of the stakeholders themselves on the issues in question. Secondly, it recognizes the different knowledge and understanding that the different stakeholders bring to the problem of advancing sustainable development through housing technologies. The data, findings and discussion are therefore organised using the identified stakeholder structure – housing users and housing practitioners. Thirdly, it shows that social issues are key to the advancement of sustainable development in the field of housing construction. And finally, the findings from the study of social aspects directly inform required developments in some of the technical aspects of sustainability assessment, specifically pricing, legislation, standards and information management. This supports the notion presented in Sachs (1999), Jørgensen *et al.* (2009) and Paredis

(2011) of co-shaping between the social and technical aspects, as discussed earlier. However, the study does not identify the intrinsic choice mechanisms of the identified stakeholders because of its focus on stated preference for specific technologies, the rational choice model it adopts and its positivist epistemological leaning.

Scarpa and Willis (2010) is another study that investigates the choice behaviour of stakeholders in the field. Like Crabtree and Hes (2009), this study employs stated preference for selected sustainable technologies, in this case renewable energy generators. The aim is to investigate households' willingness to pay the much higher cost of installing these technologies. For example, Scarpa and Willis (2010) report that a fossil fuel boiler cost £2,500 in 2008 whereas a much smaller ground source heat pump cost £10,281 and takes up more space. The findings from their survey of 1,279 British households reveal that households value renewable energy technologies but are unwilling to pay such high costs. The authors conclude that the differences in cost between fossil fuel technologies and renewable technologies must be altered, either through government grants or sharp reductions in the price of renewable energy technologies. This conclusion is interesting because it does not call for changes in the housing users' choice mechanisms as a means of advancing sustainable development. Rather, they call for measures that will make the renewable technologies more appealing to housing users within their own values and preferences.

Rid and Profeta (2011) also investigate the problem of adopting sustainable development innovations with the aim of determining the potential market for sustainable housing. They interrogate the question of existing values at the user stakeholder level. The study uses choice theory to provide the concepts by which stated preferences are investigated, with the aim of demonstrating possible market volume for sustainable housing in Germany. Similar to Crabtree and Hes (2009), Rid and Profeta (2011) employ an empirical approach based on stated preferences data of home buyers for a range of housing development attributes. They combine eight different sustainable development attributes (such as technical installations for resource protection) as the independent variables and analyse responses from 402 online survey respondents. Their findings show that low environmental awareness and high initial cost are some of the factors that could account for the current low demand for sustainable housing in Germany. They show that the latent demand is much higher than the current demand, highlighting the potential to increase the market share of sustainable housing.

A critical analysis of this study shows that it has the following features:

- i.) The study, like Crabtree and Hes (2009), focuses on environmental impacts, related to the quality of life of future generations. No economic impacts are featured.
- ii.) The study makes no clear causal links between sustainability and the attributes it selects. For instance, one of the attributes selected is whether or not social classes (by age or income levels) are mixed or homogenous within a residential development. It is hard to see what impacts this attribute has on economic development or even on environmental sustainability.
- iii.) Only two of the eight attributes selected in this study are related to the impacts from the building fabric that the current research seeks to investigate, and both only indirectly. The first attribute that is indirectly related to the building fabric, cost, is more directly a concern of the user than of sustainable development *per se* – sustainable development is concerned with cost effectiveness. The second attribute refers to add-ons to the building fabric, such as solar panels, rather than to any changes to the choice of materials and methods used for the building fabric itself. All the other attributes relate to neighbourhood layout, services and the like.
- iv.) The study was conducted in a developed region of the world where advances in sustainability regimes create possible assumptions about stakeholder' values. In fact, the study focuses only on the home buyers' values that are related to sustainability attributes.

This study by Rid and Profeta (2011) also highlights the growing recognition of the importance of stakeholders' choice behaviour to sustainable development in the field of housing construction. However, it employs a positivist approach to the stated problem, investigating only the extent of the demand for sustainable housing.

Crabtree and Hes (2009), Scarpa and Willis (2010) and Rid and Profeta (2011) all follow the popular tradition of earlier choice experiments in housing studies, which used quantitative surveys and choice experiment designs to evaluate preferences for specific attributes or products (for instance Lindberg *et al.*, 1989). While this quantitative approach is useful for showing the extent to which stakeholders would choose a given item, it does not reveal how and why the choice decisions were arrived at. Powe *et al.* (2005) and Lindberg *et al.* (1989) point out that researchers also adopt qualitative

approaches, which are more fruitful for exploring and understanding complex choice problems. Indeed, Crabtree and Hes (2009) incorporate some iterative interviews with their surveys, and this enables a better understanding of some of their emergent survey findings.

While none of the authors reviewed here offers a comprehensive understanding of the underlying mechanisms of choice, several of them have suggested what might be the reasoning that lies behind stakeholders' choice of construction materials and methods. For instance, Zhang and Canning (2011) state that functionality, occupant comfort and design integrity are some of the factors that determine choice of building materials. Crabtree and Hes (2009) report on user comfort and health as being relevant choice considerations. Hay (2010) gives stakeholders' egocentric values as choice determinants. Priemus (2005) reminds us that sustainable development issues are not necessarily paramount since there are several other considerations on which successful housing has to be judged, such as flexibility, affordability, technical requirements and demand from the market. According to Melchert (2007), a crucial value held by users is 'modernity and modern technology', while the building industry is interested in 'economic interest'. However, many of these statements describing stakeholders' choice determinants are more anecdotal than evidence based. Even where they are the outcome of empirical research, such as in Melchert (2007) and Crabtree and Hes (2009), they do not provide a broad theoretical understanding of stakeholders' choice mechanisms.

As discussed above, Koebel (1999) shows that an important factor in the large scale adoption of innovation is the feedback from early adopters' judgement of the innovation, and this means that understanding the basis on which their judgement is made is crucial. That these judgements are made on complex and non-static mechanisms is not in doubt. As Crabtree and Hes (2009) write:

In examining market uptake of innovation in environmental products, an absence of established processes of preference formation is encountered, because the issues, technologies and societal expectations surrounding environmental concerns are relatively new and unfamiliar to individuals, markets and societies. As environmental issues are an arena that can easily evoke ideas of the common good, individual choice behaviour will here be complicated by perceptions of citizen norms. This suggests

numerous points of tension in the uptake of sustainable housing technologies. (Crabtree and Hes, 2009:221)

Clearly, there still remains an urgent need for a comprehensive understanding of the inherent behavioural mechanisms of housing users and housing practitioners for choice between options of housing construction materials and methods. This knowledge is crucial since, as has been discussed, choice of housing construction materials and methods directly affects the adoption of innovation and hence the advancement of sustainable development in the field. There is therefore also an urgent need to clarify the nature of the relationship between these stakeholders' choice mechanisms and the mechanisms of change that the sustainable development ideology provides.

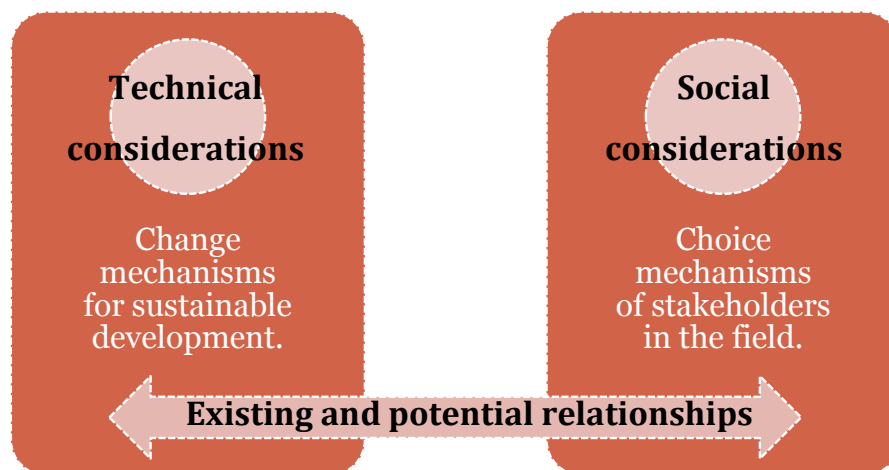


Figure 8: *Change and Choice in Housing Production*

This has led to the development of the following research questions for the present research:

1. What are the inherent choice mechanisms of stakeholders in the field of housing construction that determine their choice of housing construction materials and methods?
2. What is the nature of the relationship between these stakeholders' choice mechanisms and sustainable development requirements for housing construction materials and methods?

2.5 Chapter Summation

The review of the literature established a number of issues:

1. An operational conceptualization of the term “sustainable development” was identified for this research, aimed at achieving the two goals of environmental sustainability and economic development.
2. The causal relationship between housing construction materials and methods and sustainable development was identified within the two operational domains of the environment and the economy. This produces a theoretical and normative requirement for change to the materials and methods currently in use for housing construction in order to advance sustainable development in the field of housing production. The review showed that this need for change is promoted through institutional steerage. Innovation in housing technologies and the assessment of impacts from housing technologies were shown to be the processes used to produce the needed change.
3. Housing users and housing practitioners were identified as the two stakeholder groups in the field whose choice behaviour affects the materials and methods used for housing construction. The literature shows that at this time, most stakeholders are not choosing materials and methods of housing construction that advance sustainable development.

The role of housing users and housing practitioners is to implement necessary changes in the field through their choice of housing construction materials and methods, in order to avoid negative environmental and economic impacts. There is clear evidence in the literature that this role is not being fulfilled to a significant extent and this is impeding the sustainable development effort in the field of housing production. Several studies were identified that investigate stakeholder behaviour, in particular choice behaviour. However, they do not provide adequate explanations for the choice decisions of these housing users and housing practitioners for choice of housing construction materials and methods.

The critical review of the literature therefore points to a need to better understand the choice behaviour of these stakeholders. The explanation of stakeholder choice behaviour can best be achieved through theoretical understandings of the stakeholders’ underlying choice mechanisms. This theoretical understanding will also enable the

clarification of the relationship between the choice determinants of the stakeholders and the change requirements of sustainable development. The next chapter presents a review of choice behaviour theories in the social sciences, in order to identify the theoretical concepts by which choice behaviour of the identified stakeholder groups can be described, categorised, understood and explained.

Chapter 3

Choice Behaviour Theories: Choice Theory, Evaluation Theory and Value Theory

3.1 Introduction to Choice Behaviour Theories

The literature has identified different stakeholder groups and indicated the various roles they play in the field of sustainable development and housing construction. Martens (2006) and Guy (2005) both call for interdisciplinary study into sustainable development issues. This chapter reviews the state of knowledge of three choice behaviour theories in the social sciences. The objective of reviewing these theories is to establish the insights and the theoretical concepts they provide for identifying, analysing and thereby developing a better understanding of the behavioural mechanisms of choice decision making at each of the identified stakeholder levels in the field, housing users and housing practitioners, as well as how these behavioural mechanisms of choice can be conceptually related to sustainable development mechanisms of change. The three theories that are reviewed here are choice theory, evaluation theory and value theory.

3.2 Choice Theory

Choice theory is the body of behavioural study that engages with theoretical understandings of choice behaviour and the interpretations of these understandings for real world choosing problems in which uncertainty is a given (March, 1978). The question is; how will choice theory contribute to a better understanding of the issues involved, at different stakeholder levels, in their choice of housing construction materials and methods? Choice theory is the field that has been developed in the social sciences for understanding and improving the behaviour of individuals and organizations when they are facing a choice decision problem. The aim of this section is to show how the current state of knowledge in choice theory provides a framework for understanding choice mechanisms at the housing user stakeholder level.

The famous economist, Kenneth Arrow first adopted an axiomatic approach to the modelling of choice behaviour (Arrow, 1951). This axiomatic model formed the basis of studying rational choice theory used widely in the social sciences. Rational choice theory is based on expected utility theory, and refers to behaviour that maximizes utility and minimizes cost (Simon, 1955). Utility in choice theory is value and principle free, relating only to the revealed preference (Seabright, 1989). In the formal rational choice theory model, axioms define the assumptions and requirements for rational choice behaviour.

Simon (1955) and (1956) questioned the dominant paradigm of rationality because, according to him, it was unrealistic to create a behavioural model of an individual that not only has complete knowledge of all the relevant issues concerning his choice, but in addition is able to compute all the possible outcomes of all of the options available to him and thereby arrive at a decision that optimizes his utility. Based on empirical studies, he argues that this is improbable, stating ‘there is a complete lack of evidence that, in actual human choice situations of any complexity, these computations can be, or are in fact, performed’ (Simon, 1955:104). Simon (1955) introduces the concept of “bounded rationality” which relates to the limits of the organism in terms of information, computation, memory and the like and how these, in turn, limit “rational” choice.

Simon (1956) explores in greater detail the effects of simple pay-off functions (such as “satisfactory” or “unsatisfactory”) and simplified search rules in choice behaviour. He showed that the information gathering process in decision making is actually deliberately simplified to a basic “sufficing” level that entails accepting the first available option that meets minimum criteria – without investigating all the available alternatives in search for the option with the best possible outcome, as the concept of utility maximization involves. Simon (1955) held that decision making behaviour does not involve maximization of utility as described in the formal theory because of the computational limits of the decision making organism and the constraints of their psychological environment. The study also discusses two dynamics that affect choice: dynamic aspiration levels, which rise over time when satisfactory options are discovered with ease and fall over time with difficulty of discovering satisfactory options, and which has the effect of producing unique or near unique solutions or of guaranteeing solutions, respectively; and the dynamic adjustment of considered alternatives, which he describes as a more persistent approach to solving a choice problem.

Simon (1955) introduced many important arguments into the developing field of choice behaviour. The practice at that time was to try to increase individual and organizational capabilities in order to improve their choice outcomes by bringing their behaviour more in line with the rational choice model. Crucially he held that it was impossible to achieve this because of physical limitations, and that it would be better to model behaviour on the mechanisms that are actually undertaken by the organism that is making the choice, which can only be learnt through observation. Rules that do not model actual choice behaviour, he maintained, are not useful for understanding choice behaviour. Furthermore, the paper argues that there is no value in creating a set of assumed rules for prescriptive choice modelling and a different set of rules for descriptive choice modelling.

These studies by Simon (1955 and 1956), and the arguments that supported them, had a strong impact on the subsequent study of choice behaviour, focussing attention more on empirical findings, as March (1978) discusses. However, this did not deter the development of the classical rationality model, which still held appeal and dominated many fields for a number of reasons which Plott (1976) lists out: Firstly, many considered the rational choice model to be the representation of an ideal way of making choices. It was regarded as the prescriptive model, as opposed to descriptive models that were representations of actual behaviour. Secondly, its axiomatic form made it useful for studying variations such as adding, altering or removing rules and assumptions as well as for comparing different choice processes. Its pure mathematical form made it suitable for testing, proving and disputing lemma. And finally, its maximized utility principles were considered to be clearly logical and intuitive for the processing of options.

Sen (1971), for instance, developed the axiomatic model to distinguish between element-valued choice functions (where the domain of the choice function is a single unit) and set-valued choice functions (where the domain of the choice function is a set of units) and showed that the results were not interchangeable. Bordes (1976) showed, using axiomatic modelling, that rationality depends on the binary relation between options. Thus 'it is "irrational" to choose x against y on $\{x,y\}$ and then, in a larger set, to choose y and reject x , which was still available' (Bordes, 1976, p453).

Plott (1976), however, interrogates the paradoxical results of rational choice theories. The approach of the study by Plott (1976) took two steps: First was to discover the rules governing all social choice, and then create a decision making system that conformed to those rules, rather than creating an *a priori* model based on intuition as most choice theory did; and second was to focus on the interpretation of the axioms. He proves that the only system that avoids perverse outcomes, by meeting minimal intuitive expectations of the system, involves distinguishing between the feasible set of options (those that are possible) and the contender set of options (those that are considered).

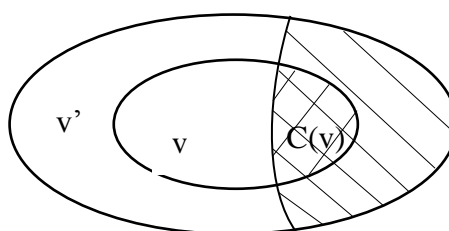


Figure 9: Feasible choice set, developed from Plott (1976)

(Source: Plott, 1976:550)

Thus he argues that social choice has no direct relation with social preference, contrary to classical theory. Social preference, the paper shows, is not all that should count in the ensuing social choice because of the concept of social welfare and the standards that are required to maintain it. He points out that this represents a subtle change in the use of axiomatic choice theory so that it is not focused on procedure, in terms of ensuring that the individual preferences become the eventual social choice outcome, but rather on substance. Institutional guidelines, behavioural regularities or some other “metaprinciple” could determine the feasible set, v' , and any preferred option $C(v)$ from the contender set, v , becomes the social choice. Plott (1976) models this choice behaviour axiomatically. Plott (1976) also makes the point that it is no surprise to find that social preferences are often similar.

Seabright (1989), like Plott (1976), discusses the need for differences in the axiomatic treatments of ideas for processing preference aggregates and the axiomatic treatments of ideas for processing judgement aggregates. This he bases on the fact that there is a difference between social decision-making on the one hand and welfare judgement on

the other hand. Seabright (1989) observes that developments in the theory of choice over time have clarified this understanding. He reasons that since individual preferences refer to what is good for their own interests whereas individual judgements relate to what is good for society, the axioms used to handle each of their aggregations must be carefully considered. People's opinions, he points out, are generally given little or no weight in social good considerations, which require experience and judgement to decide. In conclusion, Seabright (1989) calls for closer mutual understandings between the philosophies of societal welfare that are concerned more with the substantive outcomes of decisions and the theories of choice and decision that are concerned more with the content of the decision process. He holds that both knowledge areas stand to benefit from one another.

Sen (1993) clarifies a basic premise of axiomatic rational choice that he holds is erroneous. This is the requirement of internal consistency which is "imposed" on many foundational axioms of rational choice theory. Internal consistency simply means that correspondences are between the options themselves. The correspondence in the binary relation discussed in Bordes (1976) above describes this requirement. Sen (1993) holds that it is impossible to determine whether decisions are consistent or not without reference to the intentions of the decision maker. The paper argues that these intentions arise from issues external to the choice function itself; internal consistency is "entailed" rather than imposed. Thus preferences depend on motivations, objectives, norms and values, and other demands that arise in the context of the decision problem. It is to these external issues that preferences are cogent and consistent rather than to one another. At the foundational level, Sen (1993) points out that the stated preference "I prefer x to y " does not mean the same thing as " x is better than y ", but must be interpreted within the context 'that takes us beyond the choices themselves' (Sen, 1993:499) and admits external correspondences. The central argument is that it is these external correspondences that determine choice preferences and that can alter decisions in ways that may be considered irrational to internal consistency theorists.

Once the external correspondences are seen as relevant, the plurality of such correspondences and the variety of forms they can take must be accommodated in investigating the implied conditions of internal correspondences. (Sen, 1993:503)

Sen (1993) also offers some examples of reasons why choice reversal would occur such that

$$\{x\} = C(\{x,y\}) \text{ yet}$$

$$\{y\} = C(\{x,y,z\}).$$

The reasons offered by Sen (1993), in addition to a possible deliberate wish to confuse, included: positional choice (for instance not wanting to be the first); epistemic value of the menu (where a new choice, z , gives you information that changes your decision to choose x); and freedom to reject (such as not wanting to stay hungry, y , when there is very little food available, x , but deliberately choosing to fast, y , when there is now the presence of adequate food, z). The study goes on to develop the axiomatic choice model by revealing the implications of removing the requirement of internal consistency.

In addition to the observed inherent problems of the classical theory model, many authors criticized the fact that the classical rational decision model simply does not describe people's actual choice behaviour (March, 1978; Tversky and Kahneman, 1981 & 1986; Dietz and Stern, 1995 among others). At the same time as the classical rational choice theory was undergoing development by classical choice theorists, March (1978) reports that a great deal of work was also being undertaken in developing empirical understandings of the decision making process. He holds, along with Simon (1955) and other descriptive theorists reviewed here, that choice engineering is only as useful as the resemblance between the assumptions the theoretical model makes and the actual choice behaviour of the decision makers.

March distinguishes between perceiving future consequences and conceiving future preferences, and argues that physical limitations on calculating future outcomes revealed by Simon (1955) also contribute to people's inability to adequately process information about their preferences. March (1978) introduces the complex idea of ambiguity in outcome preferences and addresses the difficulties that occur in trying to formalize the concept of ambiguity in a theoretical model. The paper further argues that rationality is not the only form of intelligence, citing learned behaviour, conventions and rules, intuition, imitation and expertise as examples of other forms of intelligent behaviour that do not require computation for choice action.

Several important observations about choice theory and its development emerge from this study:

- 1) March (1978) observes that descriptive and prescriptive theories of choice have developed together and affect one another.
- 2) He also holds that one major contribution of Simon's "bounded rationality" concept to the development of choice theory was that trying to make people's choice behaviour more closely resemble the theoretical rational choice model was no longer accepted as ensuring improvements in choice behaviour.
- 3) Choice theory is involved with two guesses: The first is a guess about 'uncertain future consequences'; and the second is a guess about 'uncertain future preferences for these consequences' (March, 1978, p589). March (1978) reveals that all the models of choice theory that use frameworks of rational behaviour are concerned with only the first guess, the guess about future consequences. These models assume that preferences are 'exogenous, stable and known with adequate precision to make decisions unambiguous' (March, 1978, p589).
- 4) The second guess, the guess about future preferences is the central focus of the paper. March (1978) argues that while rational choice theories require preferences to be absolute, relevant, stable, consistent and precise, empirical evidence shows that people manage, construct, change and even avoid or suppress their preferences, or treat them strategically. Classical prescriptive choice models do not capture this ambiguous nature of preferences.
- 5) In conclusion, March (1987) believes that choice engineering should accept the intelligence in human goal ambiguity and make it 'somewhat less of a mystery, somewhat more of a technology' (March, 1978:602) in order to better improve choice behaviour.

The importance of these observations is that rather than distinguishing between classical models and descriptive models, March (1987) is arguing for a single realistic theoretical model. Furthermore, rather than the traditional approach of viewing choice engineering as an effort at making choice behaviour resemble the rational model, he sees choice engineering as an effort to alter choice outcomes that is based on the understanding of actual choice behaviour. The paper clearly distinguishes between the two types of choice engineering strategies; choice engineering that seeks to alter values, or conversely, choice engineering that operates within minimum value change.

The historical development of the theory of choice behaviour can thus be seen to have played an important role in the way choice behaviour is understood: by the use of axiomatic models; by the eventual acceptance and incorporation of empirical observations of choice behaviour; and by new directions in choice engineering. In fact, subsequent studies in choice behaviour were often based on observations, and yet successfully theorized formally the behaviours in question, even into axiomatic models. For instance a crucial study by Tversky and Kahneman (1981) also can be seen to attend to the second guess of which choice theory is concerned, as discussed in March (1978), the guess about future preferences. The paper demonstrates the phenomenon of preference reversal observed in field experiments, which goes directly against the consistency and coherence criteria of rational choice.

Tversky and Kahneman (1981) and (1986) argue that it is the classical rational choice theory that is deficient because of its inability to support preference reversal behaviour, which is exhibited systematically and consistently by decision makers. Tversky and Kahneman (1981) define a decision problem as encompassing three issues: firstly, the actual ‘acts or options’ from which a choice is to be made; secondly, what might emanate from the choice, that is ‘the possible outcomes or consequences’; and thirdly ‘contingencies or conditional probabilities that relate outcomes to acts’, that is the extent to which a given option can guarantee a given consequence (Tversky and Kahneman, 1981:453).

The central line of reasoning of Tversky and Kahneman (1981) is that acts, outcomes and contingencies can all be framed in different ways, which changes the formulation of the problem. These changes in the formulation of the problem alter and even reverse ‘the relative desirability of options’ (Tversky and Kahneman, 1981:453), resulting in different choice outcomes. The paper describes experiments and real life situations that demonstrate preference reversals attributable to differences in framing. Based on the observed effects of framing, Tversky and Kahneman (1981) introduce an alternative choice behaviour theory they call Prospect Theory. Prospect theory simply states that both the decision weight (relative to probability) and the value function (relative to gains and losses) in a decision problem are non-linear, and it is this characteristic non-linearity that makes choices dependent on framing.

Tversky and Kahneman (1981) believe that prospect theory and analysis of framing explains preference shifts and other seemingly “irrational” behaviour better than

Simon's "bounded rationality" concept (Simon, 1955). They further point out that while most framing occurs unconsciously, it is also possible to deliberately manipulate frames in order to engineer outcomes, such as is done in advertising or self-control efforts. However, they caution that the deliberate manipulation of frames raises ethical issues.

In Tversky and Kahneman (1986) they extend their arguments for rejecting the normative claims and suppositions of rational choice models and alternative rationality models such as "bounded rationality". Instead they recommend that empirical observations be used to decide choice issues. Prospect theory, they point out, is based purely on descriptive empirical knowledge and is able to explain some seemingly irrational preference behaviour by applying principles of perception and judgement. The paper lists the factors that control framing as

- i.) 'the manner in which the choice problem is presented', and
- ii.) 'norms, habits and expectations of the decision maker.'

(Tversky and Kahneman, 1986:S257)

In this way, Tversky and Kahneman (1986) contribute to the advancement of empirical choice theory.

Herrnstein (1990) is another author who uses observed choice behaviour to develop a decision theory which is called the matching law. The other descriptive choice theorists have argued that rational choice theory has limited value either as a basis for describing choice behaviour or as a basis for engineering it. Contrarily, Herrnstein (1990) argues that rational choice theory was not meant to be used to describe choice behaviour, but that an aggregate of the descriptive studies may produce psychological principles that will serve to account for human choice behaviour that may be considered irrational. He does assert, however, that rational theory has value for choice engineering since utility maximization still remains the best logic that can govern choice making. His findings show that human and animal choice behaviour displays melioration and melioration does not maximize reinforcement or utility.

Melioration describes behaviour where a decision maker shifts to a better alternative but, over time, the reinforcement rate from the options change and the decision maker alters his choice again. Herrnstein (1990) shows that this is because both utilities and the probabilities used by decision makers to discount uncertainty are subjectively

generated and their functions are not linear. Rational choice theory represents the special static case of the matching law, where there are no temporal distributions in the choice. The paper shows, however, that where choice options continue to be presented over time, melioration is observed.

This study by Herrnstein (1990) exemplifies one important feature in the development of the field of choice theory that is important to point out here: the matching law model differs from other less formal descriptive based theoretical models. Herrnstein (1990) observed that most theorists tend to believe that human behaviour is ‘too chaotic to be rigorously accounted for with any precision’ (Herrnstein, 1990:357). The matching law model, unlike previous descriptive studies, does account for human behaviour with formal precision. He points out that as an alternative to classical rational theory, the matching law possesses both rational theory’s intuitive appeal and the rigorous, formal, testable structure that is responsible for much of rational theory’s popularity, while at the same time describing actual choice behaviour.

Other descriptive choice studies that employ models that more closely involve a formal choice model are found in the literature. Dietz and Stern (1995) argue for a choice theory model that refines the earlier computational models to make a more realistic model. They also criticize preference models for their failure to treat values adequately. They present a classification and rule model, which they argue is based on social determinants which have developed through genetic and cultural evolutionary processes. Their bounded rationality model is not based on limiting calculations as the formal models suggest. Rather, they argue that when faced with decisions, humans classify the situation if it is familiar, or use simple comparisons if it is an unfamiliar situation, and then assess only key options, outcomes and values that the classification activates. Even complex decisions, they hold, are reduced to selected key elements for decision making.

The paper states that values and social influences are the determinants of the key elements on which the decision maker focuses. Values, they hold, are usually stable by adulthood and have a very strong influence on decision maker’s choice processes by truncating the list of options and outcomes to be considered. In addition to severely limiting the list of considered options and outcomes, the list of the values that are to inform decisions is also shortened. The paper shows that values themselves are classified and key values selected as determinants for given situations. Values are

clustered by value orientations which help highlight the likely outcome of decisions and thereby simplify choice. The paper points out that many studies have confirmed that the primary clusters that drive decisions are an egoistic value orientation (which focuses attention on outcomes that would affect oneself) or an altruistic value orientation (which overrides the effects on oneself and focuses only on the welfare of others); however values such as morality or patriotism also become dominant imperatives if activated in decision making.

The paper further discusses the fact that social influences strongly affect individual decision maker's choice processes. Peer groups or the mass media for instance simplify the choice problem by the way they frame it. Framing focuses attention on specific outcomes. Such social influencing can 'define the problem and help construct individual preferences' (Dietz and Stern, 1995:271) and may result in choice outcomes that are contrary to what calculated rationality would have produced. It is conceivable that this social determination of preferences could also partly explain the general similarities in people's preferences referred to in Plott (1976).

Mass media and advertising are discussed in Dietz and Stern (1995) as examples of deliberate and systematic efforts at manipulating choice behaviour through framing. They point out that social movements, such as the civil rights movement and the environmental movement, are also effectively engaged in such framing in order to focus on specific values that support their goal. The expectation is that change will be achieved by activating individuals' own moral values and norms. The opponents of a given movement simply appeal to different values.

Finally, the implication for the aggregation of individual preferences to access social choice was brought to light. A socially embedded preference construction model reveals that quantitative aggregation, as is undertaken under formal social choice theories, is essentially unproductive since socially informed choice behaviour implies that we are not dealing with independent, individually calculated decisions. The study therefore argues for checks and balances as a better way of securing 'normatively ideal social choices' (Dietz and Stern, 1995:273). This argument reflects those made by Seabright (1989) and Plott (1976) when they distinguish between preference based choices and welfare based choices.

Kalai *et al* (2002), for their part, argue that a choice is based not on one rationale but on many. They describe this as rationalization by multiple rationales. They employ rather

than abandon the rational choice model and its axiomatic structure to “refine” the theory to incorporate multiple rationales. This compares closely with the notion of a vector utility function proposed by Simon (1955) to replace the scalar utility function in cases where outcomes do not have a ‘common denominator’, such as choosing between jobs with different salaries, distances, conditions of work, etc. Also, Tversky and Kahneman (1981) discuss a notion of compound outcomes which relates to the same phenomenon.

The study offers three examples of rationalization by multiple rationales. The first is the ‘epistemic value of the menu’ situation in Sen (1993) in which knowledge of new alternatives alters choice outcome, implying that more than one rationale informed the choices. The second example is the u, v procedure, where a decision maker maximises u (such as morality) as long as it results in a minimum v value (such as egoistic requirements). However, in a new set where the u maximal element is below the minimum accepted v value, the decision maker switches to v maximization, even where the first choice is still available in the new set. This would appear to formally map a process whereby moral choices, for instance, become the determining choice factor, as mentioned in Dietz and Stern (1995) above. The third example given is the “Best from among the popular” procedure which involves two rationales, one for grouping and another for choosing the best out of the favourite group. This paper by Kalai *et al* (2002) also typifies the blurring of the lines between the classical choice theory and descriptive choice theory by presenting the model in the form of formal axiomatics that incorporate observed behaviour.

Masatlioglu and Ok (2005) also incorporate a widely observed descriptive choice behaviour into the rational choice model. In this study, a status quo bias is introduced into the model. Status quo bias is described here as the tendency of decision makers to evaluate a current or default option highly. They observe that the status quo bias effectively works as a type of simplification of options. They apply a ‘psychological switching cost’ which is the extra value that the status quo option is endowed with, so that another option would have to have a higher value than that of the status quo plus its endowment, before it would be considered worth switching to. Furthermore, they find that a status quo point can still alter a decision maker’s choice even when it is not eventually chosen, and can also explain preference reversal. The paper refers to Tversky and Kahneman (1981), discussed above, who talk about a reference outcome to which expected outcomes are compared, which Masatlioglu and Og (2005) argue is the equivalent of a status quo.

Ergin and Sarver (2010) also apply axioms in their study in order to reflect observed choices made after costly contemplation. Their stated objective is to account for observed choice behaviour in a situation where the individual decision-maker, being unsure of their taste, is willing to pay an extra cost to contemplate their options. The utility function, they explain, is adapted to be *ex post*, since the decision only occurs after the contemplation. The axiom that is central to their accounting for this behaviour is called the “aversion to contingency planning axiom”. They describe the axiom’s interpretation to be that at the first order: a decision maker would choose not to engage in unnecessary considerations, such as with an inconsequential choice set. This model approaches the behaviour described in the third example of multiple rationales given by Kalai *et al* (2002) involving two stages of choice; grouping and then choosing from the favourite group.

To recap, this analytic review of the development of social choice theory and decision theory reveals that there is no single theoretical model but rather a series of choice values and choice processes that have been identified and theoretically analysed. Choice modelling is concerned with the theoretical understanding of choice behaviour as it is and as it should be (Herrnstein, 1990). The historical survey of the literature highlighted the fact that the initial distinction between the formal choice model and descriptive models has eroded to produce a single type of model which aims to explain choice behaviour. In the process of developing this single model, the theory has developed a great deal of insight into choice behaviour. We can see from the review that choice behaviour is determined by the values of the decision maker, and that social forces also exert a strong influence. The body of work on choice theory distinguishes preference-based choice mechanisms from welfare based choice mechanisms, the latter being based on metatheories and executed using standards. Preference-based choice behaviour exhibits a wide range of choice processes, as the above discussion has shown.

Choice theory thus contains a range of theoretical concepts for discussing the casual mechanisms of choice decisions that are based on the preferences of the ordinary decision maker. Dietz and Stern (1995) point out ‘in many cases, preferences remain unarticulated in the absence of queries from social researchers and others’ (Dietz and Stern, 1995:262). Field research is therefore useful for detecting and making explicit some of the often unidentified preferences, and the causal factors informing them.

Choice engineering is concerned with the altering of choice outcomes to obtain choices that are recognizably better (March, 1978). It is now widely accepted that choice engineering should be based on actual choice behaviour. Initially choice engineering employed the rational choice behaviour model, which March (1978) points out had limited success. As the survey has shown, a number of authors call for choice engineering to be based on realistic choice behaviour models. This review showed a number of ways in which choice engineering strategies can be applied based on knowledge of actual choice behaviour. This is very important to the present study because of the need to not just understand but to also alter choice behaviour, to advance sustainable development.

Choice theory provides the theoretical concepts with which to analyse the values and choice process that determine preference-based choice decisions. It is suitable for understanding and working with the choice behaviour of housing users because their choices are not based on expert knowledge of housing production. It is not, however, suitable for understanding the choice behaviour of building practitioners. Building practitioners occupy a different decision-theoretical realm because of their level of training and experience with regard to the subject matter; building materials and methods. This is the realm of evaluation theory.

3.3 Evaluation Theory

Evaluation theory is the branch of social science that engages with theoretical understandings of the merit and value of an object and the interpretation of these understandings for real world choosing problems in which a high level of expertise about the subject matter is a given (Pawson and Tilley, 1999; Guba and Lincoln, 1981). The aim of this section is to show how the current state of knowledge in evaluation theory provides a framework for understanding the mechanisms that determine choice among housing practitioners. The preceding review discussed how members of the housing user stakeholder group rely, for their choice of housing construction materials and methods, on a range of preference-based behavioural attributes, while policy makers are guided by social welfare judgements. Practitioners, however, possess the relevant knowledge and experience to base their choice of housing construction

materials and methods on performance evaluation. The question is; how will evaluation theory contribute to a better understanding of the mechanisms in operation for choosing housing construction materials and methods among housing practitioners?

Evaluation is concerned with ascertaining the performance of an entity (Clarke and Dawson, 1999). Rossi *et al* (2004) describes the evaluation process as systematically 'gathering, analysing and interpreting evidence about ... performance' (Rossi *et al.*, 2004:16). They state that this process results in a credible value being fixed on an evaluation entity. Patton (1987) explains that evaluation is systematic information gathering for use for, among other purposes, decision making concerning the impacts of an evaluation entity. Owen and Rogers (1999) report that evaluation is useful for reporting both intended and unintended impacts.

Pawson and Tilley (1997) state that evaluation provides information for policy makers and practitioners to base decisions on. Guba and Lincoln (1981) describe evaluation as a rational decision making process, in as far as it is based on detailed professional knowledge of the evaluation entity, local decision makers' clear understanding of the outcome needs and theoretical knowledge of the causal link between the evaluation entity and the desired outcome. They explain that evaluation of performance can be used for both existing entities and proposed entities. Ruddock (1981) also describes the result of the evaluation process as being able to provide an assessment of the short and long term effects of what we do and how we do it. In particular, Ruddock (1981) points out that evaluation is useful for judging performance in relation to value-based objectives.

The evaluation process itself comprises two parts: on the one hand, it entails an accurate description of the entity's performance, and this involves the collection and analysis of factual data; on the other hand, it also entails a judgement of that performance, which requires something beyond ordinary data; judgement requires the relevant standards and values on which it is to be based, and these standards and values must be understood, clarified and verified (Rossi *et al*, 2004; Clarke and Dawson, 1999; Guba and Lincoln, 1981). Thus, Ruddock (1981) describes the evaluation process as 'relating fact to value' (Ruddock, 1981:10). Guba and Lincoln (1981) express this two part process as the description of intrinsic merit, which is an objective property of the entity and is thus not usually time or place sensitive; and a judgement of the worth of that entity in a given temporal and spatial context, based on a value set that is neither necessarily stable

nor consensus-based. They state that evaluating merit and worth are ‘separate decisions, made on separate criteria ...’ (Guba and Lincoln, 1981:48).

According to Rossi *et al.* (2004), the evaluation criteria on which the entity’s performance is to be measured are explicitly stated. They assert that such criteria must be straightforward and valid. Similarly, Ruddock (1981) holds that the values and standards by which judgement of the entity’s worth is to be based must also be explicit. Guba and Lincoln (1981) point out that in order to determine the level at which an entity’s performance will be judged as inadequate, its impacts are compared to a set of requirements that are external to the entity. These requirements are the human values, which Ruddock (1981) holds, are primary in evaluation.

Evaluation theorists explain that there are multiple goals, multiple performance areas and multiple values on which an entity can be evaluated (Owen and Rogers, 1999; Ruddock, 1981). Guba and Lincoln (1981) point out that it is just as important to choose the right goals as it is to choose the right criteria, and there may often be need to manage the conflicting values of different stakeholders. As a result of this multiplicity, there is always need to define what constitutes success and determine how to measure the effectiveness with which the evaluation entity has met the stated goals, as Clarke and Dawson (1999) explain. Rossi *et al* (2004) show that it is important to identify and focus on the specific areas of performance that are being considered, and ensure that the information gathered is relevant to that specific performance dimension.

One strategy widely discussed in the literature for determining which performance dimension to focus on is by conducting evaluation research. Patton (1987), Weiss, (1995) and Pawson and Tilley (1997), among others, distinguish between general evaluation and evaluation research. As indicated by them, utility, practicality and relevance are the central emphasis for general evaluation. Evaluation research, however, has a different focus. Evaluation research, they assert, is theory-driven and emphasizes causality, generalisability and credibility (Chen, 1990). Clarke and Dawson (1999) give the more general purpose of evaluation research to be:

... to study the effectiveness with which existing knowledge is used to inform and guide practical action. (Clarke and Dawson, 1999:2)

Pawson and Tilley (1997) show that evaluation creates the theoretical space for establishing theory-based causal links between an expected outcome and the properties of the evaluation entity that impact upon this outcome, the theoretical basis of the

evaluation being drawn from existing knowledge or hypotheses of causation. In addition, evaluation creates the theoretical space for assessing to what extent the identified causal links are relevant in the field, as Clarke and Dawson (1999) have observed. Chen and Rossi (1980) further state that applying theory in the evaluation process enables all the relevant information to be made available and this therefore improves decision-making.

The evaluation theory literature identifies two forms of evaluation according to their purpose. These two types of evaluation are formative evaluation in which the purpose is to guide improvement (Scriven, 1996); and summative evaluation in which the purpose is to provide a summary judgement on performance (Rossi *et al.*, 2004). Summative evaluation provides the necessary information to determine whether an option should be accepted or rejected. Thus it is directly related to decisions on whether an option is appropriate for use or not (Owen and Rogers, 1999) such as choice decisions. However, the major sustainable development impact assessment tools in common use, which were discussed earlier in chapter 2, clearly take the form of formative evaluation in that they do not aim for the proscription of unsuitable options.

Finally, several authors report on the learning process that arises as a result of the evaluation feedback and knowledge (Rudduck, 1981; Guba and Lincoln, 1981; Patton, 1987; Owen and Rogers, 1999). In this regard, Reichardt (1994) points out that while summative evaluation retains the independence of decision making, formative evaluation needs to go hand-in-hand with advances in substantive knowledge about the evaluation entity in order to ensure progress, rather than a focus on advancing the evaluation process itself. This distinction is important because it highlights the different requirements of actors using the different types of evaluation.

Evaluation theory provides the theoretical concepts for understanding performance-based choice decision making where a high level of expertise is involved. It is therefore useful for analysing choice behaviour among housing practitioners for construction materials and methods options. The review of evaluation theory has shown that evaluation entails both the factual description of the evaluation entity's performance and the contextual judgement of that performance. This serves as an adequate choice framework for understanding the choice process among housing practitioners, whose knowledge and professional experience requires them to have such detailed knowledge of housing construction materials and methods.

The selection of the criteria on which the performance is to be evaluated is therefore a function of the housing practitioner's values. The review also shows that for research purposes the evaluation criteria is derived directly from theoretical understandings of causal relationships between the evaluation entity and the performance need. This means that for this research, the study can focus the attention of the housing practitioners on the causal relationship between housing construction technologies as the evaluation entity and sustainable development requirements as the performance need.

In essence, while choice theory has been shown to provide information on how to frame choice outcomes that are based on preference, evaluation theory provides information on how to frame evaluation outcomes that are based on performance. The review of the literature on evaluation theory reveals that evaluation theory differs from choice theory in two important ways: (1) while information gathering for choice is usually subject to unskilled processes, information gathering for evaluation is systematic and evidenced; (2) the utility function in decision making is usually referenced to implicit factors, while evaluation is referenced to explicitly stated, contextually established criteria and value standards.

In other crucial aspects, however, the two decision making theories converge. For one thing, both choice decision makers and evaluators have been shown to access a range of factors on which their choice is based, and the factors that are selected as central to the decision problem directly affect the choice outcome that emerges. Furthermore, and crucial to this study, these factors are determined by the values of the stakeholders. In both theories, the values on which decisions are based have been shown to be external to the choice objects themselves, and to determine the criteria on which choice decisions are based. And finally, evidence has been provided to show that in both cases, choice decision makers learn from new information and experiences, and this new knowledge can alter their choice outcomes.

Values have been shown to be of crucial importance to the choice decision process in both preference-based choice decision making and performance-based choice decision making. The next section therefore discusses value theory and the theoretical concepts that it brings to the research.

3.4 Value Theory

For both choice theory and evaluation theory, values have been seen to play a central role in choice decision making. Furthermore, sustainable development has been shown to be an ethical value concept. Value theory is the body of work that aims to answer, at the philosophical level, the questions of how and why a thing is good or better, and how it is of value. Value theory literature identifies:

- 1 Three different classifications of value theories: consequential, moral or deontological.
- 2 Two different types of values that direct people's decisions: moral or nonmoral.
- 3 Two different categories for the ways that value statements are specified: neutral or relative.

Three classifications of value theories are identified in the literature on value theory: ethical or moral value theories; consequential value theories and deontological value systems. Ethical or moral value theories define what has moral or ethical value; they deal with the universal moral values that define how something can be considered right or wrong (Darwall, 2003). Thus they are judgemental, answering the question of how and why interpersonal behaviour is right or wrong. They direct how we should and should not treat others, based on their right or claim to good (Kymlicka, 1988). So for example 'you shall not kill another human being' has universal moral value based on every human being's claim to the right to life. Ethical theories are requirements not options, and are therefore basis for political involvement, such as legislating and imposing of sanctions for noncompliance (Mill, 1998).

Consequential value theories are different. They define what has outcome value; they judge everything in terms of consequences (Dreier, 1993). Consequentialism is any theory that causally relates our actions or motives or rules to states of affairs (Sen, 2003) rather than to the moral quality of our behaviour. Thus they are evaluative; defining what condition is better or worse. They are also normative in as far as they require the promotion of the good. The term 'consequentialism' was coined by G. E. M. Anscombe in her 1958 seminal paper, *Modern moral philosophy* (Anscombe, 1958). Consequential theories deal with the values that are prior to morality (e.g. loss of human life), rather than directing behaviour (do not kill) (Darwall, 2003; Anscombe, 1958).

Human life can be lost through a variety of ways, including as a result of an earthquake for instance, which has no moral implications but the loss of life that results can be considered an undesirable state of affairs. Utilitarianism is the most common of the consequentialist type of theories. Utilitarianism requires choosing the option that has utility for maximising the good or minimizing the bad.

Sustainable development qualifies as a consequentialist theory in as far as it makes the causal link between our actions and their impacts on the state of the economy and the environment. Sustainable development is a normative theory in as far as it directs us to choose the option that best promotes economic development and supports environmental sustainability. However, sustainable development is also based on moral values in as far as its equity principles direct interpersonal behaviour and require us to avoid reducing other people's chances of attaining a good quality of life, as has been shown. Sustainable development theory is therefore moral consequentialism.

While value theories may be consequential or moral, or indeed both, the values themselves that they are based on are described by whether they are moral values or nonmoral values. Nonmoral values are those that have no involvement with the rights of others. For instance, Rawls (1971) and Kymlicka (1988) are among the authors who describe classical utilitarianism, which is utilitarianism that is nonmoral consequentialist. In classical utilitarianism, value is invested in the 'state of affairs' rather than in individuals (Williams, 1981). The duty then, is to pursue the option that maximises the good in the overall state of affairs, 'regardless of how *individuals* fare' (Kymlicka, 1988: p181, emphasis from original). Nagel (1986) describes this outcome as the impersonally best outcome because here no individual has any claim to good, or even to oppose harm to himself or others if it results in greater good. One is in fact required to give up one's interests or projects if by so doing the best state of affairs is served.

Victims to the theory may thereby be created and the rights of victims are not protected in classical utilitarianism. Rawls (2005) argues that this is because this form of utilitarianism does not fully respect the separateness of persons. This classical form of utilitarianism gives no consideration to interpersonal behaviour; rather Kymlicka (1998) describes them as doctrines advancing nonmoral ideals such as aesthetic ideals for instance. Furthermore, Kymlicka (1988) points out that as nonmoral theory, these do not merit political involvement.

Moral values recognise the separateness of persons and take into consideration the equal rights of individuals. For instance, another form of utilitarianism, which Sen (2003) calls welfarism, seeks to maximise utility for each individual. Welfarist utilitarian theories recognise every person's claim to the rights and seek to maximise the good for every person. The fact that this may result in the overall maximisation of good is merely a by-product, rather than the central goal, of welfarist utilitarianism (Kymlicka, 1998). Any normative theory that takes this welfarist form of utilitarianism is an outcome or consequentialist moral theory. As a moral theory, it merits government attention, support and protection.

It is clear that one important question that arises in value theory is: who is the good good for? (Kraut, 2007). Where value is placed is central to understanding the type of a value, moral or nonmoral.

Egoism and altruism have been discussed earlier in the section on choice theory as the most common value orientations among individuals (Dietz and Stern, 1995). Egoism and altruism are both nonmoral value orientations. Again, they are nonmoral because they are not concerned with directing interpersonal interactions. For egoists and altruists, the value of an action is based on the consequence for the agent himself: his requirements, his preferences and his projects. Egoism requires that the agent's preferences and projects be given the first consideration in all choices, while altruism requires that they come last. So, for instance, an egoist may prefer to use his leisure time to watch an interesting show and an altruist may prefer to give his leisure time to serving in a soup kitchen. Neither pursuit will receive, or expect, legislative or administrative support.

These pursuits are as a result of autonomous interests, desires and preferences that generate from nonmoral rather than moral values (Nagel, 1986). Again, as nonmoral theories, neither egoistic nor altruistic pursuits attract policy intervention or support. Nonetheless, the right to freedom of autonomy is a universal moral value of liberty which individuals have claim to and defend; it is the individual's right to determine and pursue autonomous values. Rather than participating in the autonomous pursuit of the nonmoral theory itself, it is the protection of the right of autonomy that is government's role. In fact, Kymlicka (1998) shows that anything less than protection of the right to make autonomous decisions would constitute harm or victimization.

Since lives have to be led from the inside, someone's essential interest in leading a life that is in fact good is not advanced when society penalizes, or discriminates against, the projects that she, on reflection, believes are most valuable for her. (Kymlicka, 1998:186)

From the above discussions, it is clear that the pursuit of consequential value theories may or may not cause harm to individuals. Moral theories forbid doing harm to others.

Deontology describes a value system that is duty bound to ensure that moral values are adhered to during the process of executing the requirements of consequentialist theories (Darwall, 2003). Deontologists seek to ensure that they do not harm individuals while in the pursuit of the wider good (McNaughton and Rawling, 1995b). This point will be illustrated below as the discussion develops. Furthermore, McNaughton and Rawling (1995b) explain that the deontological project, based as it is on universally honoured moral values, makes deontologists go beyond observing the rules and constraints themselves: Deontologists also contribute to ensuring that others obey the moral rules. Thus not only would a deontologist not kill an innocent person, they would also seek to ensure that other agents feel equally constrained. Deontologists contribute to ensuring that others obey the moral rules by educating, encouraging and possibly even disciplining others into compliance.

In addition, McNaughton and Rawling (1995a) describe a second factor that generates deontological duty: this is known as duties of special relationships. They explain that this is where 'the person on the "other end" of the relationship has a special claim on the agent in virtue of that relationship' (McNaughton and Rawling, 1995a:325). The example they give of this is the duty a parent owes his child. This relationship would also describe the duty a building professional (or any professional) owes his client.

Deontological constraints in a consequentialist theory ensure that there are no victims; individuals are protected from harm. However, even where consequentialist theories have deontological constraints built into them to protect the rights of individuals, Rawls (2005) points out that there could still be one basic flaw in consequentialist logic that requires attention. This flaw is that such theories tend to adopt what is described as 'perfectionist' views of the good. Rawls (2005) defines perfectionist theories as those that define what constitutes the good based on a particular conception and even require governments to distribute goods (such as taxes) in ways that promote the specific good that the theory focuses on. As Kymlicka puts it

A perfectionist theory includes a particular view, or range of views, as to what dispositions and attributes define human perfection, and it views the development of these as our essential interest. (Kymlicka, 1998:185)

Society then penalizes or otherwise discriminates against people who prioritise other concerns, while the state takes on the responsibility of teaching its citizens about a ‘virtuous life’.

A perfectionist theory is considered problematic in two ways. Firstly, its definition of state of affairs is limited to only the utility it promotes. However, as Sen (2003) points out, there are many other problems and issues that constitute the state of affairs which are quite serious and require attention, but fall outside the vision and action of the perfectionist. Secondly, as Hare (1976) points out, there is a distinction between people’s legitimate individual desires and everyone’s interests. Kymlicka (1998) holds that people will defend their right to autonomy in the face of perfectionist views, in terms of their ability to take, and even change, their own decisions. The solution, proposed by liberalists such as Mill (1998) and Dworkin (1983) is to redefine the theory of the good in ways that enable the distribution of good to promote freedom of autonomy. Sen (2003) takes it a step further, arguing that the defence of individual autonomous rights needs to be incorporated directly into the theory itself.

This means that the way that values and value theories are specified is very important. The literature on value theory identifies two distinct categories in relation to the specification of values – neutral and relative. An agent-relative value, as defined by Pettit (1997), is one that cannot be spelt out without an essential reference to a specific agent; similarly, a temporally-relative value is one that relates to a specific time (Louise, 2004). A neutral value, on the other hand, is one that can be fully expressed without reference to any specific time or person. Neutrality or relativity is important because it provides the foundation for a rule, a constraint or a reason for action. To illustrate: ‘Schools should be well equipped’ is an example of an agent- and temporally-neutral consequentialist value that informs a rule, whereas a school administrator saying ‘I must not lie to get more money to better equip my school’ is an example of an agent- and temporally-relative value that defines a deontological constraint on his interpersonal actions.

Louise (2004) further shows that every relative value has an equivalent neutral, universal value it honours. Again, to illustrate: the relative value ‘I must not lie to get

more money to better equip my school' is an active promotion of the neutral moral value 'It is wrong to lie'. This illustration has applied three value statements:

- 1 'Schools should be well equipped', which is a neutral, pre-moral, consequentialist type value statement aimed at ensuring a good education for all.
- 2 'I must not lie to get more money to better equip my school', which is a relative deontological value statement that activates a moral value during the advancement of the consequential value.
- 3 'It is wrong to lie', which is the neutral moral value statement that the relative value activates.

Thus the deontological value statement introduces morality into the consequentialist theory. The relative deontological value statement serves here to help ensure that the agent does no harm to another person in the quest to achieve the nonmoral consequentialist maximisation of the good; in this case, well-equipped schools. It does this by directing interpersonal behaviour through the activation of the moral value that constrains the agent from telling a lie.

Relative values can also serve another important function: they provide reasons to act to advance neutral values (McNaughton and Rawling, 1995b). Relative values prohibit or enjoin action by specifying who should act (agent specific), when the action is required (temporally specific) or what qualifications are required for the action (ability specific), for instance. While universal neutral values are honoured by all, they may not require that action be taken by all in their pursuit. It is the relative value specification that provides the basis for action. For instance, we may all believe that restaurants should be clean but this would not lead us to pick up a mop if there is a mess in a restaurant we are eating at. We expect that there is an agent who is specified to act in order to pursue this value that we all honour. Similarly, the temporal value specification designates when action should be taken. Louise (2004) show that the agent and temporally specific value specification are intrinsically bound together in order to provide a reason to act. 'Is there a doctor in the house?' is a familiar call that demonstrates how the agent and temporal specific value statement produces action – only when someone requires urgent medical attention, and only from a doctor.

The value theory literature also interrogates the problem of conflict of values between moral and nonmoral values. For instance, where human life is valued, would it be right

to kill one person if by his death many lives could be saved? Imagine for instance, that during a long-haul flight, a passenger is confirmed to be carrying a highly contagious and deadly virus to which he himself is immune. The other passengers are at risk of death and killing the passenger who hosts the virus will save everyone else. Classical utilitarianism holds one duty bound to kill the one in order to save the many, since this is the option that best maximises valuable human life. The deontologist, however, introduces morality through a relative value statement that makes it wrong for him (or any other relevant agent) to carry out such an act, based on the one victim's equal claim to life. He is constrained from the act of killing by his moral duty.

Obviously, introducing the deontological constraint does not solve the dilemma. What does? In the case of the virus carrying airline passenger, do we kill the one or allow the death of many? In the case of the ill-equipped school, do we lie to get the needed funding or educate our students in a poorly equipped environment? I think that intuitively, the only satisfactory answer for both examples would be, neither. Each option in a conflict of values goes against the honoured consequential or moral value. Rather, from an analytical perspective based on the foregoing discussions, I identify here, one further duty or obligation that is neither moral nor consequential; the duty to search for options that do not result in either immoral conduct or unfavourable consequences. Airlines now spray the cabins with germ killers just before take-off. Schools now host fund-raising events. Alternative options are found.

To find suitable options successfully requires identifying the problem, preferably before it even becomes a source of conflict of values, and applying some level of knowledge and innovation in the approach to the problem. This highlights a property of the agent that can best be described as 'ability'; it specifies the contribution an agent is able to make. Being able to apply a sound knowledge base and being able to discover innovative solutions to conflicts of values in the operation of normative theories are therefore ability-relative reasons for action. In this case, they promote this neutral value: conflict between moral and consequential values should be eliminated wherever possible.

By analytical reasoning, I would therefore conclude that eliminating the conflict between morality and consequentialism is also a deontological function. This additional function of deontology clarifies a long and complex obfuscation of value positions. It elucidates the hitherto 'obscure topic' of deontology (Nagel, 1988:156). It eliminates

the need to speak of deontology as non-consequentialism and breaks the ‘apparent deadlock’ between consequentialism and its critics (Scheffler, 1988). Indeed, as Dreier (1993) and Kraut (2007) point out, all value theories are ultimately consequential as they most show that a good is good for something or someone. It also lays to rest what McNaughton and Rawling (1995b) describe as the unsupportable logic of conflating consequentialism vs. deontology with value relativity vs. value neutrality .

A crucial value problem for any moral consequentialist theory is therefore essentially one of properly specifying the neutral and relative value statements:

- i. Adequately specified neutral value statements ensure that individual rights are protected equally and also that perfectionism is avoided.
- ii. Adequately specified agent and temporal relative value statements ensure action by specifying, respectively, agents who are to act and the time action is needed.
- iii. Adequately specified ability relative value statements ensure that conflict of values is avoided through innovation by providing the ability relative reason to act.

The specification of relative values requires suitable agent, temporal and ability structures on which the specified values will be based.

Earlier, in chapter 2, this study highlighted the differences between the normative theory of ‘sustainability’ and the normative theory of sustainable development. Two different readings of ‘sustainability’ were identified in the literature: the ecocentric reading and the homocentric reading of the problem of sustainability. Value theory sheds more light on the distinction between these three typologies. They are all outcome evaluative theories in as far as they show causal links between our actions and the state of affairs. They differ by where value is placed. On the one hand, there is the homocentric version of ‘sustainability’ which places value in people. Ecocentric readings of the problem of ‘sustainability’, on the other hand, place value in the ecology, so that the state of affairs of the environment is the final good they aim to promote. People become means to maximising this end. This is classical utilitarian nonmoral consequentialism. Value theory provides an understanding of why, historically, this environmentalist version of ‘sustainability’ theory found it difficult to receive policy support: even though it may be possible that many consider it an admirable value theory, it remains, crucially, a nonmoral value theory.

Sustainable development, on the other hand, did receive global support and action as soon as the concept was introduced by the Brundtland Report. Sustainable development places value directly in people; it is a homocentric reading of the issues, so that the state of affairs they aim to maximise is the quality of human life. Thus it is welfarist utilitarian consequentialism. People are not the means to an end but the end in itself, of the good. It shows how our actions can reduce or increase the ability of other people to achieve a better quality of life and directs that we avoid generating negative impacts on the state of affairs for the sake of the wellbeing of others: promoting the interpersonal, and therefore moral, value.

Similarly, homocentric readings of ‘sustainability’ place value directly in people. However, even this homocentric reading of sustainability falls short of qualifying as a political morality because it does not seek the good of all. The two principles of inter- and intra-generational equity that form the foundation of sustainable development do not focus only on future generations, but argue as well for the rights of people in the present generation to the good. In this way, they defend the rights of all equally. Homocentric readings of ‘sustainability’ focus on the equity claims of future generations to a good quality of life. The Brundtland report, as we have seen in chapter 2, argues that if people in future generations have a rightful claim to a good quality of life, there would be no logic to ignoring this same claim among the poor people of present generation who are unable to meet their needs as a direct result of our actions. It should be observed here that even where the ‘triple bottom line’ notions of economic sustainability and social sustainability are introduced to expand the sphere of operation of homocentric sustainability beyond the environmental, they do not operate under any equity or other interpersonal principle: they seek the good of those directly using the service rather than seeking to protect the quality of life of others. They are still nonmoral values.

Sustainable development seeks to direct the interpersonal effects of one’s actions in both the environmental domain and the economic domain on the quality of life of all. Thus it can be clearly seen that sustainable development is based on a belief not only in human rights but in equal human rights. Value theory shows why it is this form that is a political morality and could therefore legitimately receive government support and qualify for sanction for non-compliance. Note, however, that this does not leave the normative theory of sustainable development free from the danger of perfectionism as described by Rawls (2005) and Kymlicka (1998) in the discussion above.

Thus value theory has been shown to describe consequentialist value theories, such as sustainable development, that are concerned with the state of affairs and moral value theories that direct interpersonal behaviour. It distinguishes moral and nonmoral values and defines what qualifies as a politically moral value. It also highlights the place of rights, in particular the equal claim to good, the rights of ‘victims’ and the rightful claim to freedom of autonomy. The value theory literature also provides an understanding of the shortcomings of consequentialist moral theories that adopt perfectionist views of the state of affairs and thereby infringe on the autonomous rights of individuals.

Value theory also explains the functions of adequately specified value statements. Specifying suitable neutral value statements was shown to overcome the perfectionist shortcomings of consequentialist theories. Specifying suitable relative value statements was shown to provide reasons for action in pursuit of neutral values. Value theory also highlights the role of innovation in resolving conflicts of values. Finally, value theory elucidates why sustainable development is a political outcome morality only in the homocentric, equal rights conceptualisations of the normative theory, such as that presented in the Brundtland Report and adopted for this research.

3.5 Chapter Summation

In this chapter, a theoretical framework for investigating and understanding the choice behaviour of housing users and housing practitioners was developed from the literature on choice behavioural theories.

- Choice theory was shown to provide the theoretical concepts with which to analyse choice decision making at the housing user stakeholder level. The choice mechanisms of housing users are preference-based. The values that determine choice include social determinants as well as the value orientation of individual choice decision makers. A number of empirically observed preference-based choice processes were also described in the literature.
- Evaluation theory was shown to provide the theoretical concepts with which to analyse choice decision making at the housing practitioner stakeholder level. The choice mechanisms of housing practitioners are performance-based. Values determine which performance areas are considered important.

Assessing the objective merit and judging the contextual worth of options are the evaluation processes described in evaluation theory literature.

- Value theory explains how values and normative theories are categorised, as a function of their approach to interpersonal relationships and of where the good is placed. In particular, value theory describes the terms under which a normative theory would qualify for steering by authorities and require universal observance. This has direct significance for the various typologies of sustainability and sustainable development discussed in this study. Value theory further confirms the appropriateness of the conceptualisation of sustainable development that has been adopted for this study. The literature on value theory also highlights the importance of adequately specifying both the neutral value statement of a normative value theory and the relative value statements for action to advance the theory.

The theoretical framework for this study is thus clearly defined. The next chapter aims to identify and describe the attributes of the study area that make it a relevant location for the research.

Chapter 4

Uyo, Nigeria – The Study Area

4.1 Introduction

This PhD thesis is the report of empirical research carried out in Uyo, Nigeria. In the previous chapters, the field of study, the research questions and the theoretical realm of the research were discussed. The aim of this chapter is to describe the study area in detail in order to highlight the attributes that make it a suitable instrumental case study area for finding answers to the research questions. This discussion will include a description of the geographic and socio-cultural characteristics of the study area as well as an analytical review of housing construction in this region.

Uyo is the capital of Akwa Ibom State, a state in south eastern Nigeria. Akwa Ibom State has a population of 3,902,051 people (NPC, 2012). The indigenous people are the Ibibios. The map in figure 10 shows the location of Uyo in Nigeria.

This chapter will open with a section on Nigeria describing in brief the main geo-politic and socio-economic features of the country that are relevant to the study. The study will then proceed with a discussion on housing production in Nigeria, using a historical analysis as well as a description of the specific characteristics of housing production in Uyo, as a study area. This descriptive analysis is a report of a survey undertaken in the study area in August, 2008.

4.2 Nigeria – Geo-political and socio-economic features



Figure 10: Map of Nigeria showing location of Uyo

(Source: www.lib.utexas.edu accessed 25/02/08)

Nigeria, a large and populous country in West Africa, occupies an area of 923,768 square kilometres (UNSD 2011); located between latitude 3° and 14° East and between longitude 4° and 14° North (see figures 10 & 12). Nigeria shares borders with the republic of Benin to the west, Niger to the north and Chad and Cameroon to the east. The Atlantic Ocean's Gulf of Guinea is to the south of the country.

Nigeria is administered as a Federal Republic, having gained independence from the British colonial masters in 1960. The country is sub-divided into 36 administrative regions called states as well as the Federal Capital Territory, Abuja.

The vegetation of Nigeria is directly affected by the Atlantic Ocean to the south and the Sahara Desert to the north. This results in tropical climate zones that span in latitudinal bands, which become drier from the south to the north: the mangrove and fresh water swamps along the southern coastal region, the rainforest belt further north, and then the tall grass savannah (sahel savannah) giving way to the short grass savannah (sudan savannah) to the extreme north of the country (LOC, 1991; Britannica, 2008) (see figure 11 below).

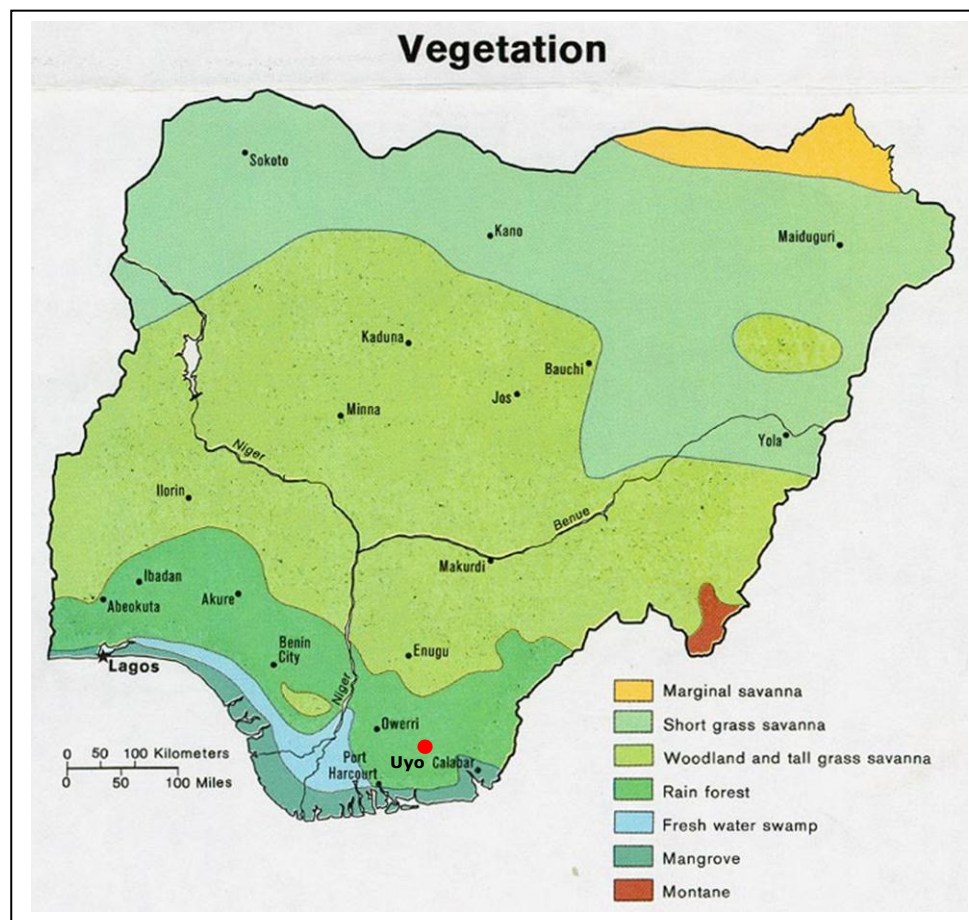


Figure 11: *Nigeria - vegetation*
(Source: www.lib.utexas.edu accessed 25/02/08)

Climatically, two major seasons are identified in the year; the rainy season and the dry season. The warm wet northbound winds, known as the southwest monsoon winds, carry moisture inland from the ocean, prevailing from April to October. This is the rainy season. The amount of precipitation decreases as you go north and the rainy

season lasts longer to the south. The south receives up to 3,000mm of precipitation annually, while the far north receives about 500mm. The dry season is between October and March, when the prevailing wind is the dry northeast trade winds, which blow southwards from inland Africa (LOC, 1991; Britannica, 2008).

The topography of most of Nigeria's surface is extensive plains, rising from the sea to about 600 to 700 metres in the northern savannah lands. Sedimentary layers cover these plains. The few exceptions are high-altitude mountain regions reaching 1,200 metre elevations and formed by volcanic activity. The River Niger and its tributary, the Benue River, are the two major rivers in Nigeria, which flow from the west and east respectively and southwards into the delta region of the coast. North of these rivers, the topography is characterised by mountainous zones, and the elevation falls again to the Chad basin in the north east, where it is 300 metres (see figure 12 below).

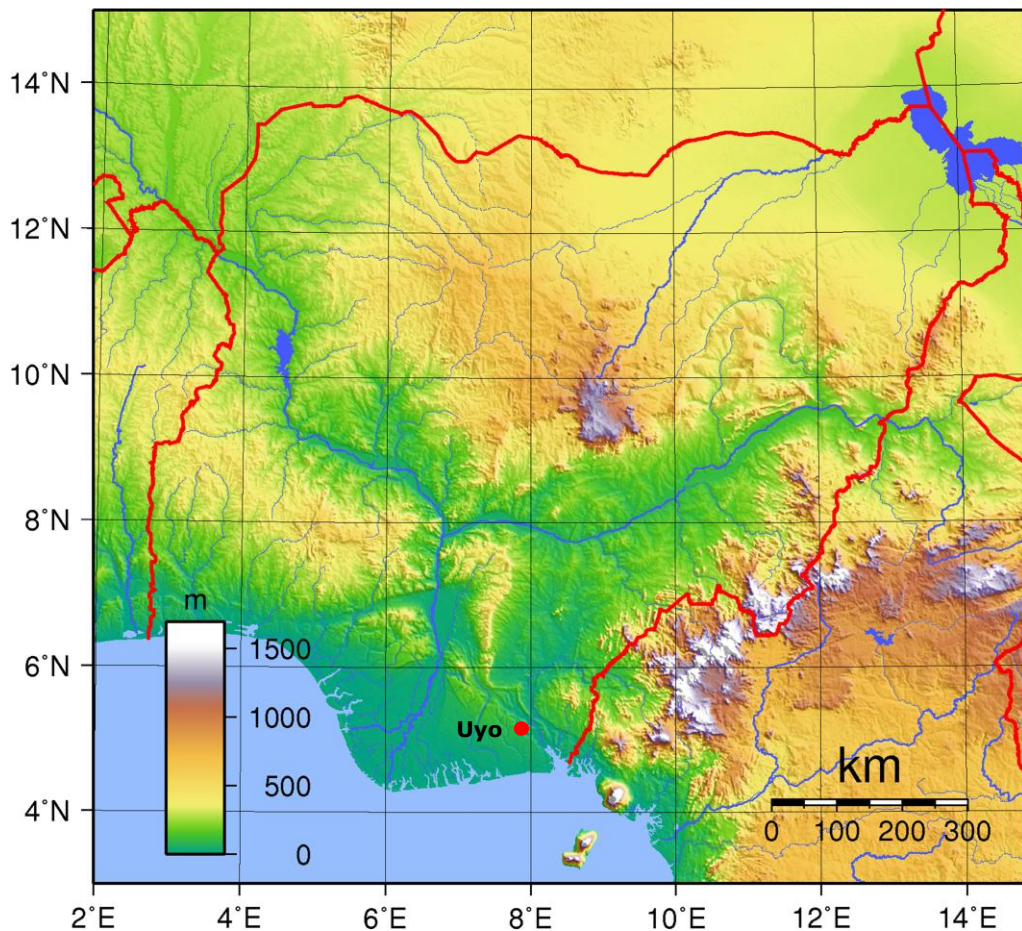


Figure 12: *Nigeria - Topography*

(Source: http://en.wikipedia.org/wiki/Image:Nigeria_Topography.png accessed 17/07/08)

Uyo is located in the heavy rainfall plains of south-eastern Nigeria, close to the Atlantic Ocean, in the African rainforest belt. Average rainfall and temperature in Uyo are 2,000mm-3,000mm and 26°C-29°C respectively (AKSG, 2011).

The most recent census, the 2006 national census, gives the population of Nigeria as 140,003,542 people (FGN, 2010), while the United Nations Statistics Division (UNSD) puts the 2008 population estimate at over 151 million (UNSD, 2011). There has been a rapid growth in population from the 55.7million established in the 1963 census (Osuide, 1988). The population of Nigeria is made up of a large number of ethnic groups, defined by Okoye (2002) as “language communities”. The number of ethnic groups in Nigeria is given as over 200 (Okoye, 2002; CIA, 2008). Nigerians live in what is characterised as large family units; the average number of persons that live together is 5-6 persons in a household, often including people outside the nuclear family (Ozo, 1990).

Based on both the per capita income and the quality of life indices, Nigeria is a developing country. The Human Development Index (HDI) value in Nigeria is low, as is shown in the United Nations Development Programme (UNDP) world map of HDI values shown in figure 13 below.

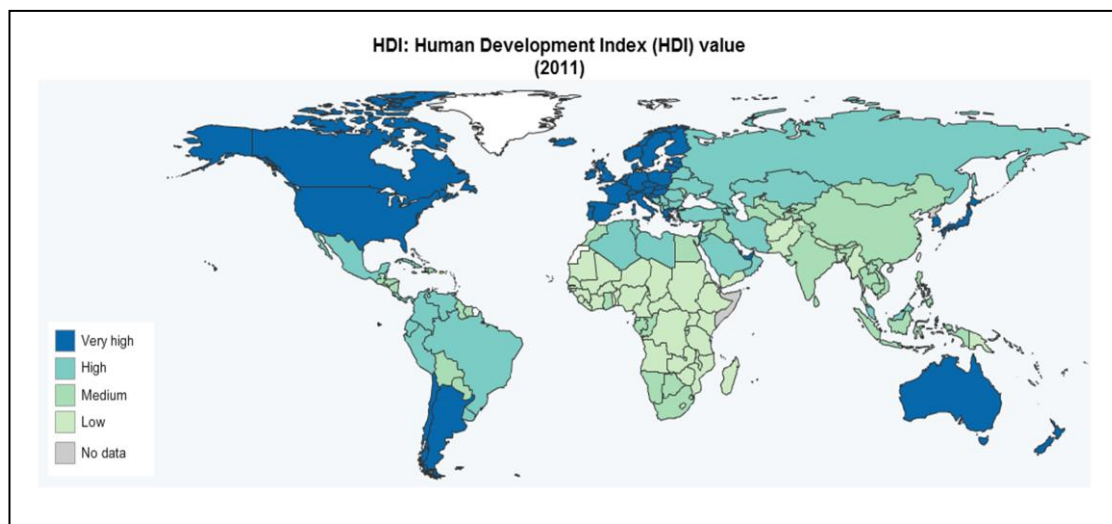


Figure 13: *World - Human development index values*

(Source: <http://hdr.undp.org/en/data/map/> accessed 31/03/12)

The developing countries of the world are reported to have a wide range of problems such as poverty and equality. The UNDP statistics show that over 70% of Nigerians are estimated to live on less than USD1 a day, and over 92% live on less than USD2 a day. In the UNDP Human Development Report of 2011, Nigeria is ranked 142nd out of the 169 ranked countries in the world in terms of her human development index (HDI), which is currently given as 0.423 (as compared to the highest ranked country, Norway, which has an HDI of 0.938) (UNDP, 2010b).

Nigeria is a signatory to all of the United Nation sustainable development agreements, including the Millenium Development Goals aimed at improving the well-being of the people of Nigeria while protecting global and local environmental assets. More than half of the population of Nigeria lives below the poverty line (FRN, 2010). Recent reports of the United Nations Development Programme (UNDP) show modest improvements in quality of life in Nigeria and in the West African region in general based on health, education and income statistics. However, they also express concern about the likely impact of the current global economic downturn, which reduces the chances of these improvements lasting in the short or long term (UNDP, 2010b).

The socioeconomic indicators for Nigeria have shown a negative trend over time. Ogunleye (2008) presents a comprehensive study of the trends in Nigeria's macroeconomic indicators based on the study of a wide range of sources. The paper reports that the countries real GDP per capita was USD479 in 1977 and USD459 in 2005. Also, in 1970 about 36% of the population lived on less than USD1 a day, but in 2000 that figure was up to 70%, representing an increase from 19 million poor people in the year 1970 to about 90 million poor people in 2000. Furthermore, in 1970 the income of the richest 2% of the population was equal to the income of the poorest 17%; in 2000 the income of the richest 2% of the population was equal to that of the poorest 55%. Ogunleye (2008) describes how considerable oil revenue combined with inadequate government policies led to both reductions in the agriculture and manufacturing sector activities and to rural-urban migration, resulting in the increases in poverty, violence and national debt evidenced in Nigeria today. High unemployment rates contributes to the poverty in the country, with a 2008 estimate of only 39% of the adult female population and 70% of the adult male population participating in the labour force (UNSD, 2011) High inflation rates, estimated at over 11% for 2009, further compound the poverty (FRN, 2010).

This means that Uyo is in a developing region, where inflation, unemployment and population growth compound severe poverty. In fact, the Akwa Ibom State Government reports that approximately 74% of the people in the state live below the poverty line (AKSG, 2005). As discussed in chapter 2, the needs of the poor are given priority in the economic development objective of sustainable development, in order to ensure that they are able to meet their basic needs. The significance of these facts is that economic development issues will not be overshadowed by environmental issues in the study area.

4.3 Nigeria – Housing production

This section is comprised of

- i.) a historical review that describes and explains the salient features of housing production in Nigeria; and
- ii.) a survey of the house types in use in Uyo.

The aim of this section is to explain the existence of different house types in Uyo and highlight why they are important to the research.

4.3.1 A historical review of housing production in Nigeria

Nigeria's history was marred by a long period of colonial rule which lasted from 1861, starting when British forces, who had seized the then trading post of Lagos, eventually forced it to become a colony. The colonial rule lasted until 1960 when Nigeria gained her independence. Colonial rule was then followed by a series of failed democracies and military coups. At this time, Nigeria is in her fourth republic, and has been under democratic rule for thirteen years, the longest period of uninterrupted democratic governance since independence. Some researchers have turned to Nigeria's political history in order to explain the current housing production situation in Nigeria. Immerwahr (2007), Gandy (2006), Okoye (2002) and Uduku (1996) all explore the issues in Nigeria's colonial and immigration history as they affect housing production in the country. Immerwahr (2007) and Gandy (2006) viewed these issues through the lens

of an urban perspective, while Okoye (2002) treated the matter within the framework of architectural theory and history. Uduku (1996) reviews the foreign influences on housing and how far these influences spread. Each of these studies is reviewed in detail below.

Immerwahr (2007) reports on the concept of the 'dual city' as depicted by studies into the consequences of colonial administrative policy in Nigeria in the field of urban policy. The study describes how under colonial rule, the dual nature of Lagos was expressed as the neatly and professionally laid-out, well-serviced, quarantined residences of the British rulers on the one hand, and the largely ignored informal settlements that grew up around Lagos to house the Nigerian citizens on the other hand. The paper holds that this dual city model continued after independence. In this way, Immerwahr (2007) shows how colonialism and the legacies of colonialism have shaped the emergence of two distinct house types in urban centres in Nigeria.

Gandy (2006) also looks at Lagos, currently the most populated city in the West African sub-region. Like Immerwahr (2007), Gandy (2006) also explored the colonial as well as the post-colonial periods, and found that administrative policies and objectives in both eras produce what he defines as a 'cultural dualism'. The concept of cultural dualism reflects and echoes Immerwahr (2007) and the dual city. While the 'dual city' concept refers to the spatial divide between the government supported, laid out enclaves and the informal settlements, the 'cultural dualism' concept as used by Gandy describes the ideology informing this policy. Gandy (2006) describes how during the colonial period, this ideology manifested as a distinction between 'modernity' and 'tradition'. Under cultural dualism, the British colonial administrators invested in the built environment only in the enclaves occupied by the foreign administrators. The areas where the African's lived were defined as 'traditional' which, Gandy (2006) reports, was officially used by the British colonial administrators to mean dirty and inferior and was in fact the tool for obscuring their failure to provide infrastructure or physical planning within these areas. This resulted in what Gandy (2006) calls 'incomplete modernity'. In the post-colonial period, he found that these colonial patterns of land use continued.

Okoye (2002) employs architectural theory and history as the framework this study uses in explaining the historical issues in housing in Nigeria as well as other countries in Africa (South Africa, Ghana and Ethiopia). From this perspective, the paper looks at

both practicing professional architects as a group and schools of architecture where architecture theory and history are studied and passed on to generations of future practising architects. Okoye (2002) found in these four countries that there existed a dual perception of foreign, western architectural history and theory in contrast to local historical architecture, and the foreign model dominated the profession, both in practice and in training. As Okoye (2002) describes, the modernist western ideology 'masquerading as the only worthwhile architectural history' dominated architecture in schools and in the field in Africa, and Nigerian professional architects 'appropriated European expertise' and the 'Western and modernist architectural theory' that came with it (Okoye, 2002:382).

Among the practitioners of formal architecture, both European and Nigerian, his study shows that an 'unofficial architectural culture' existed which portrayed local historical architecture as uninspiring and unworthy of emulation, in a replay of what Okoye (2002) calls 'colonial-era ignorance and disparagement of things African and traditional' (Okoye, 2002:386). In the schools of architecture, he found an on-going debate between, on the one hand, those for whom Africa's rich architectural heritage represented an important theory and history which they felt should be central to architectural training; and on the other hand, those for whom African architectural histories seemed quite irrelevant to the aspirations of modernising nations. The middle ground in this debate was occupied by those who believed in the importance of history but found no satisfactory way of incorporating it into the studio training of future architects. This, the author holds, was complicated by, among other things, the fact that in Nigeria alone there are over two hundred and fifty language communities each with their own architectural history, none of which could justifiably be considered more representative of Nigerian traditional architecture than another.

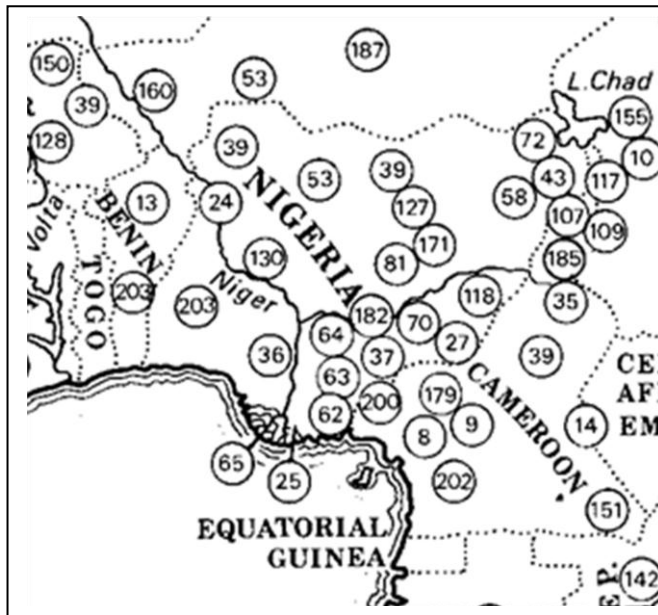
Okoye (2002) considers the failure of Nigerian schools of architecture to engage fully with traditional architectural histories a 'crisis of identity' (Okoye, 2002:387), and observes that it is by interrogating the colonial heritage of Western theory and history that the schools of architecture have been able to begin to deal with the topic of African traditional architectural theory and history.

The study by Uduku (1996) shows that in the field, these colonial and other influences were partly limited in their spread across Nigeria by geographic obstacles. Uduku (1996) describes the historical development of housing fabric in different parts of

Nigeria as they were affected by outside influences in past centuries, and the peculiarity of the south-eastern area in this regard. The Islamic Jihads made their way into the arid north of Nigeria, bringing with them Islamic architecture and urban culture. Uduku (1996) explains that these Islamic influences had some bearing on the way the vernacular architecture of the Hausa tribes in Northern Nigeria developed. The Jihads were unable to penetrate south into the rainforest region because of the vegetation and the humid climate, which were unsuited to their horseback mode of conveyance. To the south-west of Nigeria, Uduku (1996) also reports that the vernacular architecture of the Yoruba tribes was influenced by freed returning African slaves who came in by sea from America and Brazil, settling and introducing new styles of building and urbanity which influenced both house forms and settlement patterns in the region. Similarly, along the coastal regions, European missionaries impacted on the architecture.

However, to the south-east of Nigeria where the thick rain forest dominates, the situation was different. Uduku (1996) holds that the lifestyle and architecture of the people developed without the kind of outside influences experienced in other parts of Nigeria. Both religious and government influences took longer to penetrate to these areas than in other parts of the country. Furthermore, the people who lived in this forest belt did not have the same kind of hierarchical central power system found in the north or the west, but lived in separate autonomous villages where egalitarianism was practiced. This autonomy as well as their egalitarian world view made it even more difficult for them to be 'converted' to new religions or colonial ways of life. Both Uduku (1996) and Oliver (1997) describe the Ibo villages in this way.

The importance to this study of the discussion on Ibo cultural autonomy can be seen from the location of Uyo, in the deep south-eastern rainforests of Nigeria, with high humidity and precipitation as was discussed at the beginning of in this chapter. Although both Uduku (1996) and Oliver (1997) refer explicitly to the Ibos, I hold that the minority Ibibios are included in this description. Figures 14 and 15 below further support this point by showing the relative locations of Ibos and Ibibios.



KEY

62 - Ibibio

63 - Ibo

Figure 14: Nigeria - Ethnic groups (1)

(Source: Denyer (1978) page x)

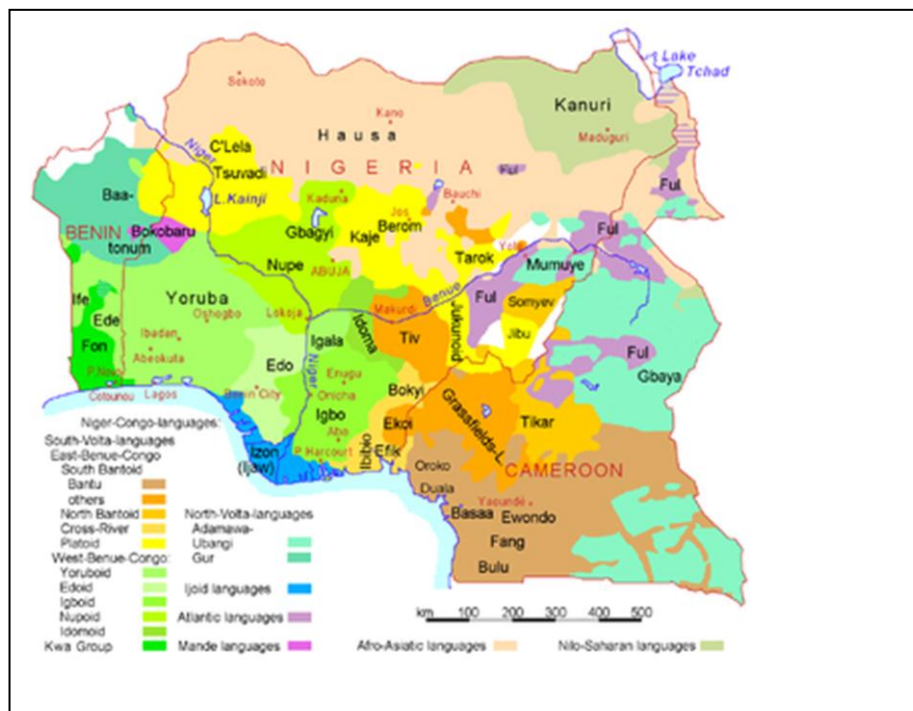


Figure 15: Nigeria - Ethnic groups (2)

(Source: http://en.wikipedia.org/wiki/Languages_of_Nigeria accessed 31/03/2012)

All of the studies discussed so far in this section show how historical events and attitudes have produced a dualistic ideology that has had direct impacts on the production of housing in Nigeria. On the one hand, there is the official recognition of and support for the modern house types that follow in the Western tradition. On the other hand, there is the lack of interest, apathy and even disdain for the spontaneous house types that are created by indigenous people.

The consequences of these ideologies are quite far reaching. Oliver (1997) observes of the preference for the Western modernization ideal, and the effect it was having on housing and architecture in Nigeria and other developing countries:

Industrial materials have been adopted and traditional forms of building have been rejected. Vernacular buildings are seen by politicians and populace alike as representative of a backward past opposed to their modern ideas and aspirations. The relentless drive towards modernization has attracted millions of people from rural areas to the cities of the 'Third World' resulting in rapid growth and abandonment of their former homes. (Oliver, 1997, pxxiii)

In more recent times, reliance on imported materials is one of the factors that have been blamed for the high cost of housing (Olotuah, 2002; Ikejiofor, 1997). For instance, Ajanlekoko (2001) reported that approximately 70% of Nigeria's cement need is supplied from outside the country. Efforts have been made towards the innovative development of housing construction materials and methods, driven largely by the need to make adequate housing more accessible in the prevailing economic climate. The Nigerian government recognises the importance of developing local building materials for housing production in Nigeria, as is evidenced by the 1994 National Construction Policy in which the promotion of indigenous building materials and industries is a major policy thrust. The policy also promotes the use of labour intensive construction technologies as a means of job creation (UNCSD, 1997).

The Nigerian Building and Road Research Institute is engaged in the development of alternative materials in order to reduce the costs of housing construction. Ogu & Ogbuozobe (2001), Ikejiofor (1997), Awotona (1988), Olotuah (2002) and Goebel (2007) all recommend the use of locally available building materials as an alternative to the imported materials used in contemporary housing construction, in order to reduce cost and improve access to housing for Nigerians. Both Olotuah (2002) and Goebel

(2007) comment on the superior environmental qualities of these local materials, such as building earth, for the Nigerian climate.

Lasisi and Ogunjide (1984) and Kuroshi (2007) report on experiments designed to improve and test the strength, durability and environmental properties of alternatives to sand and cement. Olotuah (2002) delivers a report on practical examples of the cost advantages derived from experiments of houses built with alternative materials. Ikejiofor (1997), for his part, maintains that the 'imaginative use of mud', as well as greatly reducing costs, can contribute to developing a Nigerian architectural style (Ikejiofor,1997:424).

The outcome that emerges from all of these historical and contemporary reports is the multiple nature of housing production in Nigeria. Nigeria's colonial legacy continues to inform current choices and has resulted in the two distinct layers or ideologies of housing production in Nigeria. The legacy of mutually exclusive modern ideologies distinct from endogenous ideologies in housing production has resulted in a clear demarcation of house types in Nigeria. Four different house types were identified from the literature as being produced under these two housing ideologies. These four house types are listed in table 3 below.

It is also important to point out here that public sector housing provision in Nigeria is described as having had a minimal impact on overall housing provision; the private sector is the effective provider of housing in the country and in the region under study (Ogu and Ogbuozobe, 2001; Ikejiofor, 1999). This has important implications for the study because with private housing, choice decisions remain with the individual housing users and the housing practitioners more than it does with public housing.

FORMAL BUREAUCRATIC 'MODERN' HOUSING PRODUCTION	INFORMAL 'TRADITIONAL' HOUSING PRODUCTION
<p>Contemporary house types: Designed by professional architects, using factory produced materials, particularly cement and metal roofs. (Ikejiofor, 1997; Okoye, 2002; Gandy, 2006; Immerwahr, 2007)</p>	<p>Vernacular house type: Used from pre-colonial times, built using local, natural materials, particularly earth and vegetable matter. (Rudofsky, 1964; Denyer, 1978; Ogu, 1994; Oliver, 1997)</p>
<p>Innovative house types: Experimental prototypes aimed at addressing the environmental or economic failings of the contemporary house type. (Lasisi and Ogunjide, 1984; Olotuah, 2002; Kuroshi, 2007)</p>	<p>Slum housing: Produced in big cities during and after colonial rule, using a variety of often non-durable materials in unsafe, overcrowded and untenured locations. (Awotona, 1988; Ikejiofor, 1997; UN-HABITAT, 2003; Payne and Majale, 2004; UN, 2000b; Immerwahr, 2007)</p>

Table 3: *House types in Nigeria (from the literature)*

4.3.2 Housing production in Uyo

As mentioned above, the indigenous people of Uyo are the ethnic group known as Ibibios. Although mention is made in Denyer (1978) of the nearby but smaller Ibibio language group who also share the tropical rain forest region to the south of the Ibos (see figures 12 & 13), there is no record of the Ibibio vernacular houses in either Denyer (1978) or the more extensive *Encyclopaedia of Vernacular Architecture of the World* by Paul Oliver (1997). This is a significant omission in view of the fact that field investigations by the author show that these houses are still in widespread production and use today in their original form, and information about them would therefore be of value to the understanding of housing in Nigeria.

This assertion is based on a survey of house types in use in Uyo conducted by the author in August, 2008. This survey identified two house types in concurrent use in the area that can be easily distinguished by their production ideology as well as by the materials

and methods used for their construction. These are the contemporary house type and the vernacular house type.

- The contemporary house type:

These follow on the same lines as modern house types produced all over Nigeria. They are built with industrialised and imported materials. They can be identified by their metal roofs, cement and sand block walls, glass windows and painted interiors and exteriors. Figure 16 below shows an example of a contemporary house type under construction.



Figure 16: *Example of a contemporary house type*

- The vernacular house type:

These are unique to the Ibibio people of south-eastern Nigeria and have been in use here for a long time. Local natural materials are used in the construction of these houses. They are characterised by thatch roofs and earth walls built onto a wooden frame. Figure 17 below shows an example of a typical vernacular house type.

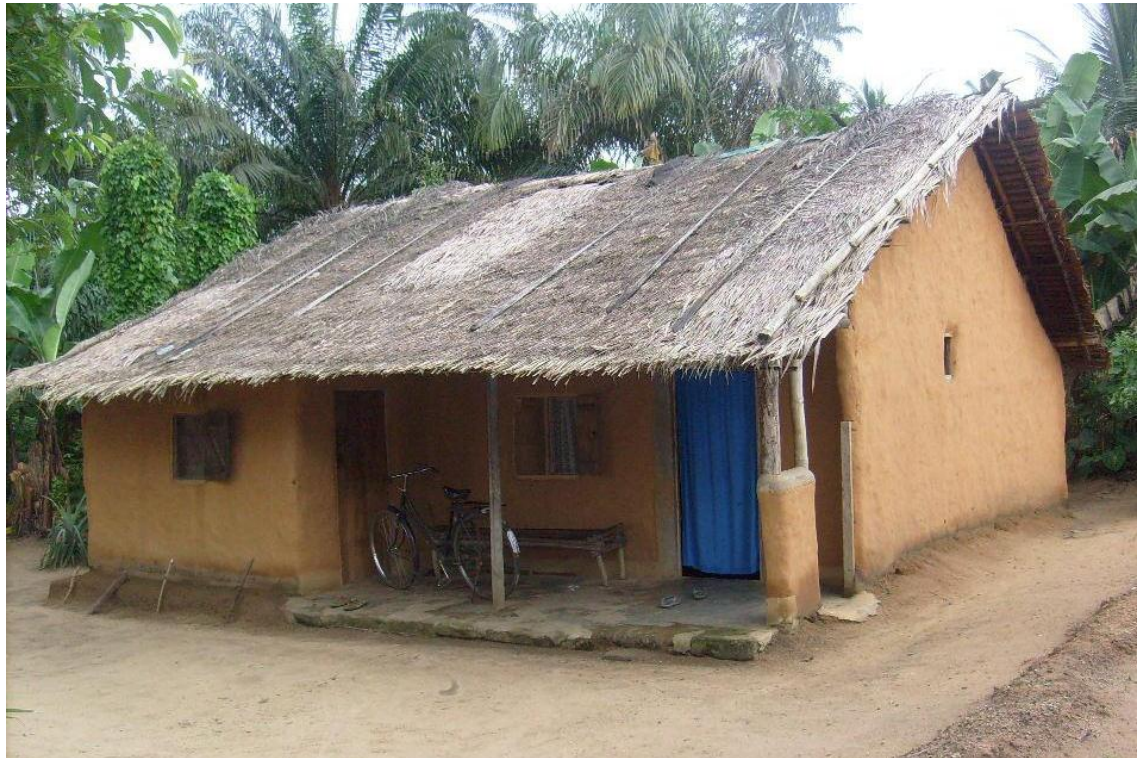


Figure 17: *Example of a vernacular house type*

As discussed above, the geographic and social features of the study area served to work against outside influences on the production of houses in Uyo. This explains why the vernacular house type has remained in production until the present, alongside the contemporary house types also in use in the study area.

What is most significant to this study is that the ideological differences extend to the housing construction technologies: the two house types use completely different materials and methods in their construction. This means that stakeholders in the field of housing construction in the study area are constantly faced with a choice of housing construction materials and methods. For this reason, the issues related to stakeholders' choice behaviour for choice of housing materials and methods options can be argued to

be relatively easier to study in this population. Care must be taken, however, to distinguish between contextual features relating to the extant ideologies discussed above and more generalizable theoretical findings.

As was already discussed in chapter 2, no policy or practical framework was found in the study area that is aimed at advancing sustainable development in the field of housing production. This was confirmed by documentary analysis of the Nigerian National Housing Policy as well as interview discussions with senior government officials at the Akwa Ibom State Ministry of Housing and Urban Development in January, 2010. The importance of this lack of overt sustainable development drive to the research is that it can be argued that the inherent choice mechanisms of stakeholders, defined here as independent of and prior to sustainable development requirements, are more readily accessible to the researcher than they would be in areas such as the United Kingdom or the Netherlands, where sustainability requirements are widely publicised and have become a part of the everyday psyche.

4.4 Chapter Summation

This chapter established a number of features about Uyo, Nigeria that make it suitable as an instrumental study area for investigating the inherent choice behaviour of stakeholders for choice of housing construction materials and methods. Briefly, these features and their implications are:

1. Uyo in particular and Nigeria in general, is a developing area with high levels of poverty among the population. Economic development is therefore of considerable importance in this region, as the study has shown. This means that the causal links between housing production and economic development will not be overshadowed by a focus on the causal links between housing production and environmental sustainability as has been observed in other parts of the world. This is useful to the research because sustainable development has been defined here as a parallel concern for economic and environmental impacts (as was discussed in chapter 2).

2. No overt sustainable development or sustainability regime was found to be operating in the study area. This is useful to the research because it means that the stakeholders' inherent requirements, preferences and influences are not obfuscated by sustainability values and processes.
3. Perhaps the most important factor that makes the study area suitable to this investigation is the presence of two house types in concurrent use, distinguishable by the materials and methods used for their construction. The discussion traced the developments in Nigeria and in the study area that resulted in two completely distinct house types being used concurrently. This characteristic of Uyo plays an important part in the instrumentality of the study area for understanding the stakeholders' choice mechanisms that determine how and why they choose from among housing technology options.

Thus this chapter explains how choice behaviour occurring within the context of Uyo, Nigeria can be argued to be inherent choice behaviour, and how this inherent choice behaviour can be argued to be readily accessed by the researcher. This justifies the selection of Uyo as the study area for the empirical research. The next chapter discusses the logic for the research strategy, the research plan and the research methods used in the empirical research.

Chapter 5

The Research Methodology

5.1 Introduction to the Research Methodology

The previous chapters presented detailed discussions on the relevant literature on the topic of this study, the theoretical framework for the study and the context in which the empirical research is conducted. This chapter will outline in detail the justifications for the methodology applied in the empirical research, the implications of applying this methodology and a detailed description of the methods used for the empirical research. Ethical considerations will also be treated. The limitations of both the research methods and the researcher will also be discussed in this chapter.

5.2 Qualitative Research Strategy

As has been discussed, this research study aims to answer the following research questions:

- I. What are the inherent choice mechanisms of stakeholders in the field of housing construction that determine their choice of housing construction materials and methods?
- II. What is the nature of the relationship between these stakeholders' choice mechanisms and sustainable development requirements for housing construction materials and methods?

Based on the theories of choice behaviour and the selected study area, the following empirical research questions have been formulated to guide the collection of empirical data in the field:

- i. What values, principles and influences determine choice of housing construction materials and methods in Uyo, Nigeria at the different stakeholder levels?
- ii. What is the relationship between these stakeholders' requirements and sustainable development requirements at the different stakeholder levels?
- iii. How important do stakeholders in Uyo, Nigeria perceive sustainable development issues to be in relation to choice of housing construction materials and methods at the different stakeholder levels?

This is a behavioural study, in the broad field of social science research. In order to understand, explain and compare the choice mechanisms of the different stakeholders, the empirical research methods used must provide deep insight into the underlying factors on which choice decisions are based. The research strategy used in this study is a qualitative strategy. Four factors influenced the choice of a qualitative research strategy: the principal orientation to theory; the epistemological orientation; the ontological orientation; and the values and biases of the researcher. Each of these factors is discussed in greater detail below.

- **Inductive orientation to theory in the research:** This research study employs inductive reasoning in the development of a theory of choice behaviour in the field of housing construction. Choice decision theories are regularly used to develop middle range theories on behaviour in the fields of economics, political science and public administration, education and health sciences on choice. Testing these theories can then be organised around a quantitative strategy. However, the present study is not a process of theory testing but of theory generation.

The contribution to knowledge is the production of a theory of choice behaviour in the domain of housing construction. Inductive reasoning is used to develop middle-level theory, which is suitable for generalising to other contexts (Lakatos, 1970; Hesse, 1974; Bhaskar, 1975). For the purpose of theory development, a qualitative research strategy is more useful (Bryman, 2008).

- **Critical realist epistemology:** The second factor affecting the choice of a qualitative research strategy is the realist epistemological orientation of the study. In studying the social world, the observed actions of people (the actual) cannot be explained without an understanding of the underlying individual and societal mechanisms (the real) and how they are activated (Sayer, 2002). These mechanisms are the properties of the entities that cause or generate the observed outcomes, and these mechanisms exist, whether they are activated or not (Bhaskar, 1975; Hesse, 1974).

From a critical realist stance, therefore, observed choice outcomes do not provide the explanation of choice behaviour. Shared societal influences and stable individual values as well as stakeholder' choice processes are recognized as having the power to determine the choice behaviour of the various stakeholders. In order to explain choice behaviour, it is necessary to provide theoretical understandings of these underlying choice mechanisms. Having developed this knowledge, the next step is to use it for the task of predicting how choice outcomes for housing construction materials and methods can be altered in order to advance sustainable development. It is this level of theoretical development that is the realist's major contribution to the increase of knowledge and it is these conceptual ideas that can be generalised to other populations and contexts (Pawson and Tilley, 1997; Sayer, 2000). While a quantitative strategy may be adequate to describe behaviour, for this deeper level of understanding of behavioural mechanisms a qualitative research strategy is needed.

- **Stratified objectivist ontology:** The ontological stance of the research also affects the choice of research strategy. As Sayer (2000) explains, the primary thesis of realism is that there is a real world out there independent from our knowledge of it. This produces a stratified ontology of what exists. Critical realist ontology therefore accepts as knowledge the underlying mechanisms that determine and give meaning to observed social outcomes such as choice behaviour (Bhaskar, 1975).

It is these deeper underlying mechanisms that the present enquiry aims to discover and describe, for which a qualitative research strategy is better suited (Bryman, 2008).

All of the three factors discussed above suggest a qualitative research strategy for the empirical enquiry. Knowledge production is based on a theoretical and analytical understanding of the underlying individual and social causal mechanisms, as well as the contexts in which these mechanisms are activated (Pawson and Tilley, 1997). The predominantly qualitative strategy used in this research enables theory to emerge from the data through a descriptive and conceptual understanding of the underlying structures that produce choice phenomena. Some quantitative data is generated in this study and analysed statistically. However, this is used not to seek for causal relationships, as in quantitative approaches, but to identify trends within a given stakeholder group. This is therefore not a mixed methods study (Bryman, 2006), but remains true to the qualitative strategy of research.

One additional factor that has affected the strategy chosen for this study is outlined below.

- **The values and biases of the researcher:** Reflexivity plays an important role in this research study. In the feminist tradition and critical theorists' standpoint, the researcher does not seek a value-neutral position to the study (Lincoln and Guba, 1985; Hesse, 1980; Mies, 1993). For this study, a normative, ethical theoretical concept, sustainable development, is used as the overriding value ideology for the research. Indeed Delamont *et al.* (2001) discuss the widely held belief that social science research needs to take sides and engage with value laden positions in order to contribute meaningfully to improving mankind's social condition. Nevertheless, this study seeks to achieve its ideological purpose without sacrificing methodological adequacy. While the researcher acknowledges her advocacy and support for sustainable development, the research strategy must aid in keeping the sustainable development advocacy of the researcher in check to reduce bias in the data collection and analysis. This it does by using a qualitative strategy, which enables the behavioural mechanisms of choice to be understood from the stakeholders' positions *as expressed by them*. In this way, the qualitative research strategy helps to check the researcher's biases.

The foregoing section explained the justification for proceeding with a qualitative research strategy. The next section outlines and analyses the research design used for the empirical study.

5.3 Case Study Research Design

Huberman and Miles (1994) and Punch (2006) both define case study as ‘a phenomenon of some sort occurring in a bounded context’ (Punch, 2006:144). Brewer and Hunter (2005) give the attributes of individuals as one type of unit or case that can be studied in case study research in the social sciences. Based on the empirical research questions, the case of study for this research is:

the inherent choice behaviour of stakeholders in Uyo, Nigeria for housing construction materials and methods options

and

the relationship between these stakeholders’ inherent choice behaviour and sustainable development mechanisms for change.

Uyo provides the context that forms the boundaries for this study. This study design is what Stake (1995) describes as an instrumental type of case study, because the selected case is instrumental to the understanding of the social phenomenon under study. Yin (2009) explains that in this type of study, a case is selected because it captures and exemplifies the social phenomenon to be studied. Furthermore, instrumental case studies are suitable for wider analytical (as opposed to empirical) generalization of the research findings (Mitchell, 1983; Yin, 2009). Stakeholders in Uyo have been shown to capture the phenomenon of inherent choice behaviour for housing construction options in context where sustainable development values have not yet become a part of the popular awareness, as was discussed in chapter 4.

Case study design is an intensive research design, intensive enough to allow for the generation of theoretical concepts (Mitchell, 1983; Yin, 2009). Because of its intensive nature, case study design is also the most suited to the investigation of causation (Miles and Huberman, 1994), which this study aims to do. Stakeholder’s choice behaviour will be studied in detail and holistically, across both stakeholder levels, in order to develop a comprehensive and in-depth understanding of why and how choice decisions are arrived at in the field of housing production. The case study design is therefore suited to the research questions.

Bryman (2008) states that the research design chosen for a research study must also be suited to specific criteria on which the quality of the research is to be evaluated. The research design has implications for the criteria by which the research would be assessed for its quality, rigour and wider potential (Mason, 2002). For the present study, the research design gives priority to three dimensions of the research process: understanding behaviour; generalising the findings; and maximising relevance or impact. These will form the main criteria on which the quality of the research will be evaluated.

With regard to satisfying the quality or reliability criterion, the case study design provides for an in-depth understanding of the phenomenon of choice behaviour from the revealed position of the stakeholders themselves. General theoretical concepts provide further credibility to the findings (Denzin, 1977). A conceptual level of abstraction of research findings from the researched case makes them generalizable to other populations (Firestone, 1993). Thus the present study aims to employ the case study design to understand choice behaviour at a theoretical level and provide a conceptual model of the relationship between choice behaviour and sustainable development, in order to satisfy the criterion of the findings being globally generalizable.

Finally, the relevance or impact of the research (Yardley, 2000) is maximised through the overriding sustainable development ideology; the study relates issues of choice to sustainable development and the advancement of sustainable development in the field. The findings from this research contribute to the achievement of sustainable development goals, which have been shown to be a topical issue of concern and urgency globally, as a result of widespread poverty and environmental destruction, which reduce people's chances of achieving a good quality of life. The research findings inform developments to sustainable development policy and action. This strengthens the tactical authenticity of the research, which refers to its ability to empower action (Lincoln and Guba, 1985).

The components that make up a research design are:

1. the theoretical framework in relation to the data to be collected;
2. the detailing of who the data will be collected from (i.e. the research participants); and
3. the detailing of how the data will be collected (i.e. the research methods).

These components situate the research in the empirical realm (Punch, 2006). Each of these three components is treated in detail in sections 5.3.1, 5.3.2 and 5.3.3 below.

5.3.1 *The theoretical framework in relation to the data*

The research questions for the study were specified from the review of the literature in chapter 2. This section shows the flow of logic from the general theoretical propositions to the research outcomes.

- The general theoretical propositions of choice mechanisms were discussed in chapter 3.
- These general theories are progressed to the empirical theoretical concepts of the inherent choice mechanisms of stakeholders in Uyo through the discussion on the context as provided in chapter 4.
- The empirical concepts flow logically to the fieldwork data collection, as this chapter on the methodology shows.
- Finally, the fieldwork data logically progresses into emerging theoretical concepts and propositions about choice behaviour and its relationship to sustainable development through data analysis, as will be discussed in chapters 6, 7 and 8.

These specific theories and propositions answer the research questions.

Figure 18 below is a flow chart that clearly details these logical links between the different research levels, thereby showing how the theoretical realm is linked to the study.

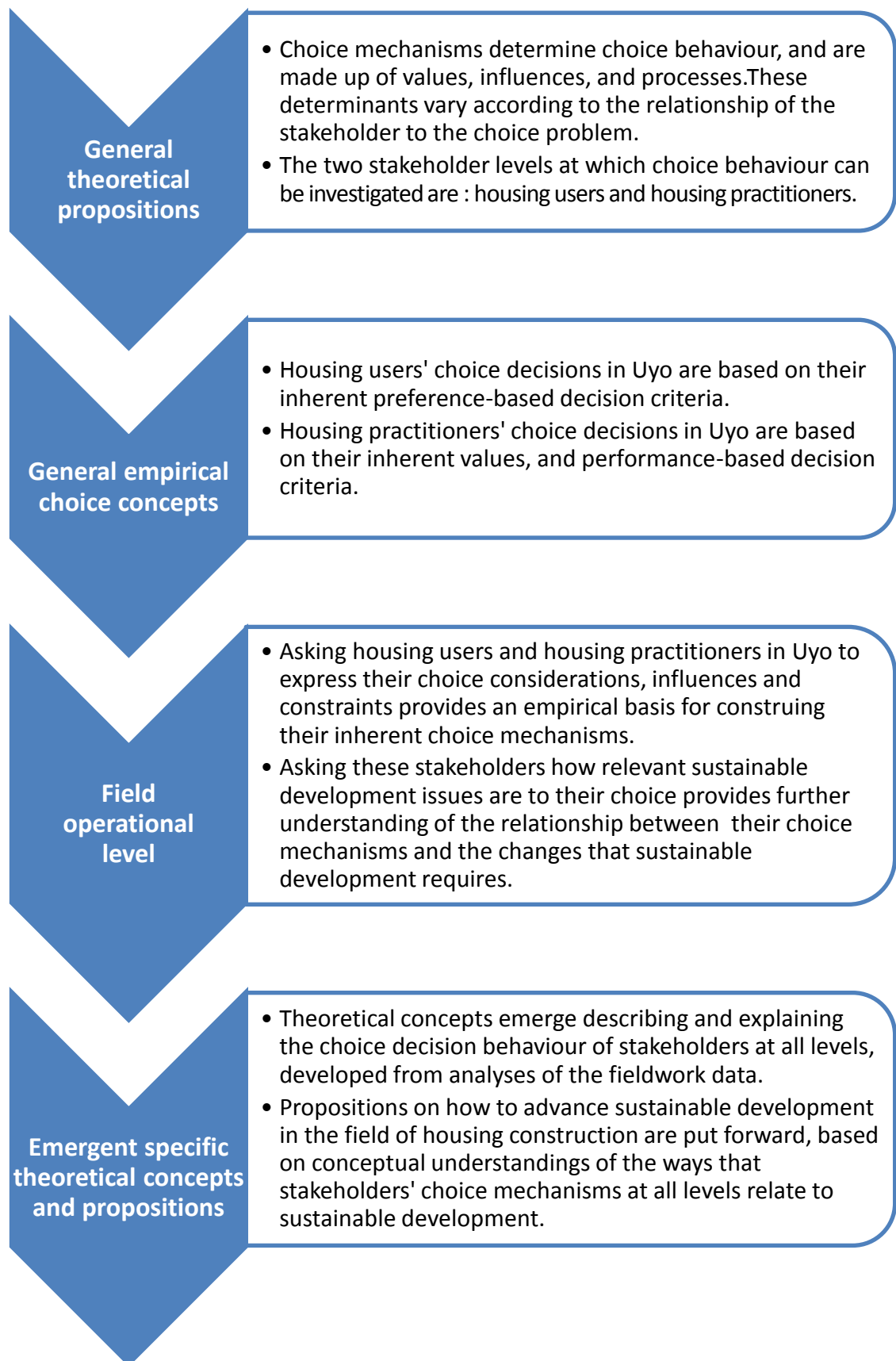


Figure 18: *Logical links from general theory to research findings*

5.3.2 The research participants – Purposive sampling

The study participants are sampled from the population using systematic purposive sampling procedures. Compelling sampling procedures are used that permit broad representation. These sampling procedures for the study are designed to suit each stakeholder level, as discussed below. The purposive sampling used here at each stakeholder level strengthens the credibility of the research by targeting participants that are most likely to have the needed information for the study.

Stakeholder Level I: Housing users

Bryman (2008) holds that transparency in a research is only demonstrated when the researcher explains how the selection of research participants reflects a broad range. Similarly, Shucksmith (2000) highlights the need to pay explicit attention to inclusiveness. The housing study by Lindberg *et al.* (1989), for instance, employs distribution by age of research participants as a means of capturing the housing preferences of a full range of housing users. The present study seeks to achieve a good element of inclusiveness among research participants by applying a logical distribution framework. To this end, rather than selecting participants who have already built houses, it employs the demographic data contained in the recent socio-economic survey undertaken by the Akwa Ibom State Ministry of Economic Development (AKSG, 2005).

Since the fieldwork is concerned with understanding the inherent factors that determine choice of housing construction materials and methods at the housing user stakeholder level, the purposive sampling strategy focuses on identifying a study population that, by their status, are in a position to consider these choices and then sample study participants from among this population. The study population is therefore defined as income earners in Uyo, the logic being that any adult with an income would be able to seriously consider the housing materials and methods he would prefer were he to have to use this income to build a house. Demographic information on income earners in the region is available from the above mentioned survey. This study uses employment status categories as a stratifying criterion that covers 100% of income earners, as tables 4 below shows. The purposive sampling strategy is to identify research participants from a broad range of these categories.

A second advantage of using employment status for the study is the existence of representative organisations in Uyo that are based on employment status. The business

owners (employers), the civil servants (employees) and the traders (self-employed) all have long standing organisations that represent the interests of their members. The percentage of each employment status category that each of these organisations represents is also shown in table 4. From this table, it can be seen that the organisations represent significant percentages of each of the employment status categories.

EMPLOYMENT STATUS CATEGORIES	Category Details %	Category Totals %	Categories Represented in This Study %	Representative Organisations
Employer	4.45	4.45	4.45	Chamber of commerce (100% of this category)
Self-Employed		40.53	40.53	Traders association (42% of this category)
Farmer	1.43			
Trade	16.87			
Others	22.23			
Employee		27.81	27.81	Civil service union (37% of this category)
Private sector	17.55			
Public sector	10.26			
Others		27.21		
Apprentices	25.96			
Information not supplied	1.25			
TOTAL	100.00	100.00	72.79	

Table 4: *Systematic sampling based on employment categories*

Source: Developed from Akwa Ibom State socio-economic study report (AKSG, 2005)

The categories selected for the study represent over 72% of the study population as can be seen in table 4 above. Nevertheless, it is important to point out at this point that

although it would appear that the apprentices were left out as study participants in the present study, apprenticeship is by nature a temporary designation; the apprentice goes on to become a member of the other three categories – either employer, employee or self-employed. This means that their interests are ultimately still represented by this sampling.

Thus, the purposive sampling used for identifying research participants at the housing user level is representative organisations from each of the major employment status categories. In addition to the advantage of ensuring broad inclusiveness and increasing the study's generalizability, this sampling strategy also enables in-depth responses to be obtained; depth is not sacrificed for breadth. Finally, this sampling strategy provides a means of verifying responses through triangulation between the different interviews, as well as a means of ensuring that theoretical saturation is reached. Maitlis and Lawrence (2007) used representative sampling in their study of musicians where they included members of the musicians' union among their interview respondents. Their research questions also provided the basis for their use of this purposive sampling strategy.

The researcher requested executives of the representative organisations to constitute groups for discussion interviews in which their members' viewpoints would be presented. Existing representation was advantageous here because it did not require any groups to be created specifically for the purpose of the research. As Kitzinger (1994) points out, natural groupings such as this, where the members already know each other, respond more openly and discuss more freely than strangers would.

Stakeholder Level II: **Housing practitioners**

As with the sampling strategy at the housing user stakeholder level, the aim of purposive sampling here is to identify a study population that is most relevant to the empirical research questions and sample from this population. The architects in Uyo were identified as the study population at this stakeholder level because the specification of construction materials and methods is their professional function. The purposive sampling strategy therefore includes all members of the local chapter of the Nigeria Institute of Architects as interview respondents. 41 questionnaires were completed and returned, representing a 74% response rate.

An iterative fieldwork interview in the form of a group discussion was also held during the course of this research. The purposive sampling employed for this was frankly opportunistic. A meeting was called by a government agency in Akwa Ibom State to which members of the Nigerian Institute of Architects were invited. Five members attended, and the researcher used this opportunity to interview them, on the advice of the chairman of the State Chapter.

5.3.3 The research method – Interviews

The research questions and research strategy require that the investigation engage directly with the research participants and construe the case of study from their own viewpoint. This indicated a fieldwork approach. The best option for investigating the research participants' viewpoints is to ask them, so that they can state 'in their own terms and in-depth' (Jones, 1985:46) what the issues are that determine their choice of housing construction materials and methods and how they think sustainable development is related to this choice. Furthermore inherent choice mechanisms, as opposed to choice outcomes, are resistant to empirical observation because they are underlying features that cannot be identified using observation techniques. The interview technique is therefore chosen as the most appropriate tool for the fieldwork.

The qualitative interview technique in fieldwork is recognized as one of the most powerful qualitative research methods for accessing peoples' meaning, understanding and interpretation of their behaviour and concerns and for providing richly detailed data (Punch, 2009; Bryman, 2008). Fontana and Frey (2008) describe the different types of interview instruments available for fieldwork research and their advantages. The choice of interview instrument used in the study was based on the number and type of study participants and the type of data required at each stakeholder level. The two types of interview instruments used in this research for investigating choice mechanisms and their relationship to sustainable development are focus group discussions and self-completion questionnaire.

- Focus group discussion interviews with the housing users provide in-depth information on the basis on which they choose housing construction materials and methods and the place of sustainable development in their choice decisions. Group discussions have the advantage of prompting a wide variety

of views on a given subject as a result of the group interaction, as Bryman (2008) points out. An interview guide was used during the semi-structured interview sessions. The interview guide is based on key words that reflect the empirical research questions. The interview guide and interview questions are provided in appendix A of this thesis. Because of the shared interests and experiences of the research participants, the issues that they consider important came to the fore and were thus made available to the researcher. The group discussion interviews generate qualitative data for analysis in the research.

- Self-completion questionnaire interviews provide information on the more explicit choice determinants of housing practitioners. The questionnaires were kept short and easy to understand in order to avoid fatigue in respondents. For this same reason, questions on personal information were put at the end. The greater part of the questionnaires contained questions concerning the issues around choice and sustainable development at this stakeholder level as dictated by the empirical research questions. The self-completion questionnaire is also provided in appendix A of this thesis. Because of the degree of individual knowledge and understanding among this respondent group, the issues that they considered important were made available to the researcher through the use of this research tool. The self-administered questionnaires contain both closed and open-ended questions. This generates both qualitative and quantitative data for analysis.
- A focus group discussion interview with the housing practitioners provides in-depth information to clarify issues arising out of the questionnaire data analysis. The interview guide and interview questions for this group discussion interview are provided in appendix A of this thesis. The transcript of this group discussion also provides qualitative data for analysis.

5.4 Data Collection

An important criterion on which the quality of qualitative research is judged is external reliability, which LeCompte and Goetz (1982) define as a function of the replicability of qualitative research. Replicability requires a detailed description of the fieldwork

procedures by which the data for the study was collected. The data collection procedures undertaken by the researcher for this study are therefore outlined in detail in this section. The researcher invited research assistants to work with her in the field. A research assistant accompanied the researcher on all her fieldwork activities to increase her security on all field trips and to assist her with recording of the data.

Stakeholder Level I: Housing users.

The researcher was inexperienced in group discussion facilitation. The researcher therefore piloted the group discussion questions on the workers at a private company in Uyo in order to confirm the effectiveness of the interview schedule and make improvements where necessary. The recording equipment was also tested at this pilot. On the 12th of December, 2010, a group of four members of this company were gathered in their offices and the interview questions were presented and discussed. The outcomes of this process were:

- confirmation that the issues sought for were revealed freely through the group discussion questions.
- the rewording of question 2 to remove the technical jargon (sustainable development) to make it more understandable to members of the public, without any change to the meaning of the question;
- experience for the researcher in facilitating the discussion to include the responses of the more quiet members of the group; and
- practice with recording and transcribing.

On the 20th of December, 2010, the researcher, together with an assistant, approached the offices of the market traders association in the Akpan Andem Market in Uyo. There they met with the secretary of the association. After discussing the topic of the research study, they requested that the organization set up a group for interviewing by the researcher. The researcher, along with her assistant, also visited the offices of the civil service association with the same request. There they met and discussed with the president of the association. Both organizations were welcoming, friendly and willing to assist the researcher.

The group discussion with members of the civil service association was conducted on the 21st of December, 2009 at their offices. Six participants were present. The

discussion lasted for one and a half hours, from 4pm until 5:30pm, and was recorded. The group discussion with members of the market traders' association was conducted on the 7th of January, 2010 in one of the market stalls. Seven participants made up this group. The discussion began at 9am and lasted for one hour and fifteen minutes. The discussion was also recorded.

The key themes explored in both of these group discussion interviews were: needs, priorities and preferences; the place of sustainable development values; duty; and institutional power. Some of the questions were phrased as vignette questions and some as direct questions in order to elicit responses about general concerns and issues among the union members that each group was representing in addition to the discussion participants' own individual viewpoints. The sequence with which the interview questions were presented was also carefully planned to avoid leading the participants.

The group discussion provided the means for the members of the group to interact and discuss each topic in depth. The role of the researcher was to ensure that all members contributed and that the participants put forward as many issues as they felt were relevant. The researcher engaged in facilitating the discussions, to encourage a wide range of responses from all members of the groups in order to achieve saturation, as evidenced by 'thematic exhaustion and variation' (Guest *et al.*, 2006:65) and also to encourage further discussion on aspects of the discussion that group members considered important or interesting. Recording the group discussions electronically and transcribing further removed the risk of the researcher's bias influencing the data collection and analysis (Heritage and Garfinkel, 1984).

On the 8th of January, 2010, the researcher, along with an assistant, approached the offices of the Uyo Chamber of Commerce, Industry, Mines and Power. There they met the secretary of the organization, and were later joined by the president. The secretary advised the researcher to proceed with the questions rather than wait to present them at a group discussion, the reason being that members of their group were usually too busy to gather at the same time for a group discussion. The researcher accepted this suggestion for three reasons. Firstly, a preliminary analysis of the previous discussions showed that thematic saturation had been reached and a discussion with the few representatives would be adequate to further confirm this. Secondly, the officials were comfortable that they could ensure that the concerns of their constituency were expressed. And the third reason was that the researcher was eager to collect responses

from a broad range of the study population in order to increase the study's inclusiveness and generalizability, and this was the only practical way to achieve it.

The secretary of the organization was interviewed for 35 minutes, followed by the president, whose interview lasted 40 minutes. In these interviews the major role of the researcher was prompting to ensure that all issues within a key area were presented by the respondent. The respondents engaged fully with each question and introduced issues of their own. In this way, the issues that they consider important for themselves and their members came to the fore and were made available to the researcher.

Stakeholder Level II: Housing construction industry practitioners.

The researcher piloted her questionnaire by distributing them to ten architects in Abuja. Eight of them were returned and studied. The outcomes of this process were:

- confirmation that the issues sought for were revealed freely;
- confirmation that the questionnaire was not too long or difficult to fill;
- rearrangement of the page layout to make it clearer and improve the flow; and
- evidence that sometimes the open-ended questions would elicit no response, which was deemed acceptable because of the value of the open ended responses, particularly if the incidence of no response is not high.

The researcher approached the offices of the Akwa Ibom State Chapter Chairman of the Nigeria Institute of Architects and requested an opportunity to distribute her self-completion questionnaires to members of the institute. The Chapter Chairman was also very helpful and used the register of members to make distribution of the questionnaires easier for the researcher. The questionnaires were subsequently distributed to the members of the Institute at meetings as well as in their offices, which they filled and returned. A total of 41 filled questionnaires were collected for the study from this group.

In addition, and subsequent to the analysis of the data from the questionnaires, the researcher again contacted the Akwa Ibom State Chapter Chairman of the Nigeria Institute of Architects and requested him to convene a group discussion. He informed the researcher of an upcoming meeting at the Akwa Ibom State Ministry of Justice to which the Chapter had been invited and advised her to hold her discussion with

members at that venue. An iterative group discussion interview was held with five members of the Nigerian Institute of Architects on the 12th of October, 2011 at 12 noon at the Akwa Ibom State Ministry of Justice during a break in their meeting. The group discussion interview lasted 30 minutes.

5.5 The Analysis of the Data

As has been discussed above, the empirical case study provides qualitative and quantitative data on how and why housing construction materials and methods are chosen among housing users and housing practitioners. In addition the empirical study provides data on the nature of the relationship between the stakeholders' choice determinants and sustainable development. Although specific contextual features may enter the data, the level of theoretical abstraction of the analysis will ensure that these contextual features do not reduce the generalizability of the findings.

The unit of analysis of this data is the inherent choice mechanisms operating at each stakeholder level, and the relationship these mechanisms might have to sustainable development. The analysis of the data will involve

- categorising the stakeholders' values,
- describing their choice processes as they are evidenced from the data at each of the stakeholder levels, and
- comparing against sustainable development mechanisms.

These are qualitative data analysis techniques. It must be pointed out that some descriptive quantitative data analysis will be undertaken. Since these are descriptive analysis used to evidence the attributes of the respondents, they do not constitute classic quantitative strategy analysis techniques such as those used for establishing relationships between variables.

Hobbs (1993) and Skeggs (1994) both find that where the level of abstraction of the analysis is theoretical, responded validation tends to be unsuitable. The credibility of the findings from this data analysis therefore relies heavily on theoretical validation. At the level of the housing practitioners, open-ended questions further add to the credibility

of the findings by reinforcing the findings from the quantitative data. The inductive approach to the study also raises issues of internal validity related to how closely the theoretical concepts emerging correspond to the data (LeCompte and Goetz, 1982). This is addressed by presenting the relevant raw data, to enable the reader appreciate how directly the findings reported are derived from the data.

Thematic analysis and coding were used to analyse all of the qualitative data. Thematic analysis relies on themes imposed on the data from the theory, a process described as 'coding down' by Silvey (1975). Coding enables the analysis of themes that arise from the data itself, referred to as 'coding up'. The quantitative data was analysed using descriptive statistics in the SPSS computer software. Appendices 3, 4 and 5 contain the full details of the coding frames for the analysis of the data. The data analysis for the data from the housing users, together with a discussion on the findings is provided in chapter 6. Chapter 7 provides the housing practitioners' data analysis and discussion. In chapter 8, the implications of the findings for advancing sustainable development are discussed.

5.6 Ethical Considerations

No sensitive information was generated in this study. The respondents were assured of anonymity in the presentation of their viewpoints. The researcher ensured that all participants were aware that the research they were participating in was for a student's thesis and not for action by any agency. The researcher also made sure that all participants felt appreciated for their contributions to the research study. Also, the researcher was never alone in the field to ensure her own safety.

5.7 Chapter Summation

In this chapter, the justification for a qualitative research strategy and a case study research design was detailed. The discussion shows that these approaches are the best way to answer the research questions. The fieldwork method was employed for data collection using two interview tools: group discussion interviews and self-completion questionnaires. These were chosen to suit the kind of information required at the different stakeholder levels. Qualitative and descriptive statistical data analysis will be used to discover, understand and present findings from the data for each of the stakeholder levels. These are discussed in the following chapters.

Chapter 6

Data Analysis and Discussion for Stakeholder Level I: HOUSING USERS

6.1 Introduction to the housing users' data analysis

As was discussed in the previous chapter, the data for the housing users is from three semi-structured interviews that were held with unions representing three employment status categories. The analysis of this data and the findings from the analysis are presented in this chapter. The empirical research questions that guided the collection of this data were:

- i. What values, principles and influences determine choice of housing construction materials and methods among housing users in Uyo, Nigeria?
- ii. What is the relationship between these stakeholders' requirements and the requirements of sustainable development?
- iii. How important do housing users in Uyo, Nigeria perceive sustainable development issues to be in relation to their choice of housing construction materials and methods?

This data is analysed in two stages.

- In the first stage, thematic analysis is used to categorise the data around predetermined themes (section 6.2).
- In the second stage, coding is used to create conceptual abstractions that emerge from the data itself (section 6.3).

The theoretical concepts used to describe the choice mechanisms identified here are from decision choice theories, which were discussed in detail in chapter 3. A nascent theory of housing users' choice mechanisms for decisions on housing construction materials and methods choices is then presented in section 6.4, based on the findings. The chapter then provides a discussion on how these identified housing users' choice mechanisms are related to sustainable development and the implications of this relationship (section 6.5).

6.2 Thematic Analysis and Findings

Thematic analysis helps to summarise the data and synthesise it around the different themes developed from the above empirical research questions. These four themes are reflected in the four questions asked during the interviews. The Framework thematic data analysis is contained in appendix B. The use of Framework serves the purpose of organising the data and also enables comparison of the data between the different organisations.

The four themes for the thematic analysis were developed from the empirical research questions. These themes are

- 1) The main considerations on which choice of housing materials and methods is based.
- 2) The place of sustainable development issues in the choice of housing construction materials and methods.
- 3) Whose duty it is to ensure that housing construction does not contribute to poverty and environmental degradation.
- 4) Support for new sustainable development legislation.

One trend that is immediately visible from the Framework in Appendix B is the large volume of data on the first two themes. This supports the selection of the context of the study; one of the attributes on which the selection was based was the fact that users in this location were constantly faced with a choice of housing construction materials and methods, and so they would be in a position to fully express the basis for their choice in this field, and they did. The reduction in responses for the last two themes can be attributed to fatigue as the discussion wore on; or perhaps to the fact that short discussions were adequate to express the thinking of the participants in relation to these themes. It could also be considered to be evidence of the fact that not much consideration has gone into these matters prior to the interviews, which would further support the selection of the context as a location where sustainable development issues are not at the fore in the public realm.

How useful is the data from the three different groups for analysing choice behaviour at the housing user stakeholder level? The assumption in this study is that choice behaviour at each stakeholder level is universal. Therefore, the data is expected to show

a high level of homogeneity of underlying choice values and processes between the three groups in the study.

During the discussion of the first theme, the data in the Framework shows that participants' responses to the vignette question raised the same type of considerations among the three groups. All of the groups raised the issues of cost, durability, low maintenance and social requirements. Furthermore, this data shows that there is a similar level of awareness about this theme among all of the groups, as the volume of data generated from the theme indicates. The volume and nature of this data also provides confirmation that theme saturation was achieved.

For the second theme, the vignette question presented to the groups deliberately raised issues of wider environmental and economic considerations. The Framework analysis shows that the civil servants responded with a discussion on selfishness while the traders discussed self-interest as overriding sustainable development concerns. The business owners' response was on what needs to be done for sustainable development to work. In spite of the different focus in the discussions of each of the groups, they all indicate that sustainable development issues are not of primary concern to this group. In this regard, the data from the three groups also exhibits a high level of homogeneity. Similarly, the Framework data indicates another similarity in the discussions of the three groups on the second question: each group discusses the socio-economic status of people that could be expected to be interested in sustainable development. In the civil service group, this is given as depending on '*exposure and orientation*', with the market traders it is level of wealth, while in the chamber of commerce data it is given as '*elitism*'.

The third theme relates to the question of whose duty it is to advance sustainable development in the field of housing construction. Here again, the data in Framework shows that one of their many responses on this theme runs through all the three groups. This common response is about the inadequacy of government actions on sustainable development issues. Notably, an analysis of the data from the three groups on this theme shows that there is no reference to any requirement for action, or any indication of failure of action, of the housing users themselves. In this, the data again shows homogeneity between the three groups.

Finally, the fourth theme investigates whether or not housing users would support new legislation on sustainable development issues. While the market traders answered no,

the business owners said they would support such legislation. In all cases however, the Framework data shows that all of the groups focused on the benefits of sustainable development innovation to the housing users themselves rather than to the wider environment or economy. This was another homogenous feature in this data.

Overall, the data in Framework shows that there is a high level of homogeneity in the responses of the three groups. This is important because it confirms the assertion made by Plott (1976) that people's choices are similar and it indicates that the findings will be both valid and generalizable. In essence, the comparison of the data from the three organisations confirms that the data from the three organisations is suitable for answering the empirical research questions.

The data on each of these four themes on which the data collection was based will now be analysed in detail.

6.2.1 Theme 1: Considerations that go into choice of housing construction materials and methods

The aim of the first interview question was to enable an understanding of the issues that determine housing users' choice of housing construction technologies. The data in appendix B portrays a range of issues that the respondents consider in relation to the choice of materials and methods for housing construction. March (1978) distinguishes between two sets of considerations in the analysis of choice. These are those considerations that are related to future consequences of selecting a certain option; and those that are related to future preferences of the decision maker. In addition, a number of authors point out the importance of social influences on choice behaviour (Dietz and Stern, 1995; Plott, 1976; Becker 1996). These three sets of considerations organize all the data on this theme.

The first set of issues investigated here is those that are related to consequence of the option chosen. These are the considerations that describe the physical attributes that the stakeholders would prefer the construction material or method to exhibit. Requirements like '*construction speed*', '*availability of materials*', '*durability*', '*permanence*', '*structural strength*', '*low maintenance*', '*quality of finishes*', '*style*', '*beauty*' and '*modernity*' constitute the considerations that the research participants express, as shown in the data under the "Main considerations" column in the Framework. The

main finding from this data is that the good described in each of the consequences given is good for the user. None of the consideration given has consequences that are good for any other beneficiary.

The consideration for cost also falls into this category relating to the preferred attributes of the option chosen. Cost is given very high importance by the participants. One of the participants in the civil service group states:

The LCM of everything is cost.

Similarly, a member of the group of market traders states:

Cost is the first consideration.

Both of the participants from the chamber of commerce also flag up the concern for cost in the choice of housing construction materials and methods, both as it affects price and in relation to inflation. The problem of inflation was also discussed among the civil service group. As cost and affordability are directly the problem of the person paying, this consideration, like all the other considerations in its category, is seen to relate to benefit for the housing user rather than any wider benefit for the good of others.

There are a number of occasions here where issue specific to the study context come through in the data. An example is the discussion on the need for low maintenance houses, which a market trader related directly to the high maintenance needs of the Ibibio traditional house. She described how rain leaks through the thatch roof and washes the walls away if the roof is not constantly repaired. However, these house types are unique to the study area. Similarly, inflation is a real problem in Nigeria, and one participant reports that a bag of cement which used to cost ₦28 in 1981, now costs ₦1,500. Again this type of hyperinflation is a contextual problem. However, these contextual issues do not distort the finding from the data in any way because it can be seen that, like all of the other considerations, the focus remains on securing the good of the user.

The second set of issues in this analysis is those that are related to the personal preference of the decision makers. The data in the “main considerations” column shows that the participants discussed individual taste, building for one’s heirs, wanting the best, and the desire to live in the same type of houses found elsewhere. Again, all of these considerations relate directly to the benefit of only the users. The equity considerations that sustainable development is based on are excluded from all of these

preference requirements. Even the consideration for wanting to leave a domicile to one's heirs, which shows concern for others, is evidence of only the housing user's interest in the good of those with whom he has a special relationship, rather than the good of the wider community.

The third set of issues is those that reference influences from the society. Pride and prestige, meeting up to society's expectations, following the crowd, cultural preferences and values, and the belittling comments that people would make are all the issues that were raised by the participants that would fall into this category of considerations. The finding from this data is that social influence plays a major role in their choice behaviour.

The main findings from the analysis of the data on this theme, therefore, are:

- i. At the housing user stakeholder level, all the considerations for consequences and preferences on which choice of housing construction materials and methods is based focus solely on what is good for the user.
- ii. Societal influences play an important role in determining housing users' choice of housing construction materials and methods.

6.2.2 Theme 2: The place of sustainable development in choice of housing construction materials and methods

The aim of the second interview question was to introduce wider environmental and economic considerations into the discussion. As earlier discussed, the conversations for this theme ran along different focuses in the three different organisations. The data on this theme is provided in the second column of the Framework in Appendix B under the heading "Place of susdev issues". This data shows that the discussion among the first group was about people's selfishness and interest in money while the second group discussed the primacy of the housing user's own interests and needs, such as the cheaper cost and improved availability of local building materials. As one participant states, the house should '*give me what I want.*' For the third group, the data shows a focus on what is needed or what is lacking to make sustainable development issues relevant to choice of housing construction materials and methods. The participants highlight lack of awareness, valuing the wrong things, and peoples' unwillingness to try new things. All of these conversations, however, point to the fact that sustainable

development issues, for whatever reason discussed, do not play a role in people's choice of housing construction materials and methods. This is the major finding from the thematic analysis of this data.

However, other interesting findings emerge from this thematic data analysis. The different organisations discussed this question differently. This variation in their conversations is instrumental to revealing another important finding. In discussing the problem of selfishness, the civil service association data indicates people's inclination to act in ways that are unjustifiably self-seeking.

... people are too selfish. Most people are only concerned about their own selfish needs and how to get the most for themselves.

In focussing on the primacy of self-interest considerations, however, the market traders are making no apology for failing to act on sustainable development concerns. The data shows that they think people are justified in prioritising what is good for them. For instance, one participant states:

I know there are some people who can consider such things. Like rich people. They can be interested in how their house is affecting others. But poor people are worrying about how to help themselves.

The data on the participants from the chamber of commerce further supports the position that self-interest among housing users is paramount and justified. The statement below shows that the participant believes that people will act based primarily on the extent to which the choice option is seen to be advantageous to them:

So the important thing is to show that it is aesthetically adequate, modern, et cetera, and people will not waste money on these expensive materials we are using now, and they will embrace it faster. Current materials may become obsolete.

One finding from this data is that there is a distinction between unacceptable selfish desires and the legitimate self-interest of the housing users. Another finding from here is that while users see that sustainable development considerations are right, they do not expect to be required to make their choices based solely or primarily on the consideration of sustainable development issues.

As discussed before, all of the groups express the belief that one's socio-economic status determines whether or not one is in a category that gives any weight to

sustainable development issues in ones choice of housing construction technology. This indicates that the participants do not think that giving consideration to sustainable development issues is a requirement that is compulsory for all housing users. The finding from this analysis therefore is that housing users do not think that it is a requirement that they give consideration to sustainable development issues.

Finally, even as this data shows that housing users' requirements and preferences were always given precedence at this stakeholder level, the data also shows that none of the users expressed any aversion to sustainable development issues as long as it does not conflict with their requirements and preferences.

If it can give me what I want, I will consider it.

is a statement from the market traders that demonstrates this point. There are even instances in the data where interview participants translate sustainable development issues into issues that highlight their own benefit, such as in relation to cost.

Well, of course, using local materials will be cheaper than all this [sic] block.

The overall findings from the data on this theme are:

- i. Housing users do not give any consideration to the sustainable development issues of wider welfare in their choice of housing construction materials and methods.
- ii. Housing users feel justified in prioritising their preferences and requirements.
- iii. Housing users are not averse to sustainable development but seek correspondence between sustainable development and their own requirements.

6.2.3 Theme 3: *Whose duty it is to act in advancing sustainable development*

The aim of this question was to indicate how the research participants relate sustainable development issues to themselves and to other stakeholders in the field of housing construction. The data in Framework on this theme shows that the discussions all centred on the failures of government that the participants perceived. The study will not conclude from this that the participants feel it is the duty of the government to take action, as this was not stated by either the civil servants or the market traders. The

chamber of commerce participants' data shows that they did state what actions they expected the government to take with regard to building materials and methods that help the economy and the environment to flourish:

... campaign, demonstrate and support ...

... encourage and utilize ...

Similarly, the civil service union discussed government role in terms of the provision of facilities. These can all be seen as envisioning a support role for government for sustainable development in the field of housing construction. The chamber of commerce data also shows that the participant perceived a role for housing practitioners to play with regard to acting for sustainable development in the field of housing production:

... the professionals should come up with these materials and demonstrate their advantages.

One member of the market traders' group began the discussion on this question by stating that it is the primary duty of the home owner, since they are the ones making the purchases. However, the discussion did not follow along this notion, but instead immediately turned to government's lack of action. Eventually, one participant indicates that the duty of the home owner is to his or her own self, and defends this position, when she states:

He is using his own money to build, so what he builds should be good for him.

The findings from this data, therefore, are that:

- i. Housing users are aware of roles and responsibilities that both government and professionals have in ensuring that the materials and methods used for housing construction promote sustainable development.
- ii. Housing users do not however identify any specific role expected of them in this regard.

6.2.4 Theme 4: Support for new legislation on sustainable development in housing production

The aim of this question was to provide an indication of how important people at the housing user stakeholder level feel sustainable development issues are in the field of housing production. As has been discussed, the data in Framework shows clear differences between the organisations in their answers to the question of whether or not they would support new legislation for sustainable development. However, an analysis of the reasons given during each group discussion reveals a number of findings from this data.

The data on the civil service discussion group shows that the discussion focused on the functioning of law as a means to ensure people's compliance, after which the conversation returned to a reiteration of people's requirements and preferences as primary, particularly for modernity and pride. The discussion showed again that housing user's main considerations for their own needs are still the primary concern. This further supports the previous findings from this thematic data analysis.

The data on the market traders' discussion group reveals that they would not support any new law for three reasons. One reason was that the current laws and bye-laws in place regulating housing construction have so far served to increase the cost of housing, and they anticipate that a new law will further exacerbate this situation:

Government already charges too much for basic services and building requirements. You have to pay for Certificate of Occupancy, planning approval, tax clearance, all kinds of things. Before you can even go to site you have spent so much. If they add more requirements – it will only make it more difficult for poor people to build.

It is clear that this view is not related to sustainable development *per se*, but rather to the perception that laws on housing production in general hinder rather than help with housing delivery. Refusing support on these grounds can therefore be translated to mean that the discussion participants believe that easing housing delivery is an important consideration.

A second reason this group give in the data for their refusal to support new laws is that, at this time, they perceive that local building materials and methods have not been adequately developed. As one participant states:

No, I will not support new laws because we may not have the range of products that we get from outside.

This could be seen as a contextual issue coming through to the data. The lack of suitable local building materials for housing construction has been shown to be a real problem that affects Nigeria. The question here again, however, is whether this response indicates how important sustainable development is to the participants or not. The answer would be that this response indicates that the participants believe that the housing users' requirements, in this case for variety of choices, overrides sustainable development considerations.

One more reason was given in this data why the members of this group would not support any new laws for sustainable development. One participant states:

When new things come out that are good, people will start using them. You will not need a law to force people to start using them.

This response highlights the logic that the adoption of innovation is determined by the value of that innovation for the adopter. The argument being made here is that making sustainable development innovations useful and attractive is more effective than making them compulsory. Again this response supports the earlier findings – it signifies that people's primary aim is to maximise their good, and also indicates the expectation that building materials and methods that support sustainable development should also benefit the home owners. Finally, this response anticipates that this type of legislation would only be needed where the requirements of sustainable development conflict with the interests of the users, which is when a law would be needed to enforce sustainable development.

The data shows that the participants from the chamber of commerce responded that they would support new laws. Again the reasons given for their support are revealing. One respondent gives his reason for supporting new laws as:

It has advantages for the government and the people.

This again indicates that the benefits of sustainable development are a primary consideration.

The major finding for this data, therefore, is that housing users do not consider sustainable development to be so important that it would override their own benefit. In

all cases, the good considered in their choice of housing construction materials and methods is not the benefit to the economy or the environment but only the benefit to the housing users themselves.

6.2.6 Summary of the findings from the thematic analysis

The data from the different group interviews has been organised into themes in order to analyse housing users' decision behaviour for choice of housing construction materials and methods. The thematic analysis of this data produced a number of important findings about the mechanisms of choice of housing construction materials and methods at the housing user stakeholder level:

- i. The data from the three different organisations was shown to be conceptually homogeneous. No patterns of variation in the findings were discerned based on the employment categories. The findings are therefore deemed as suitable for understanding choice behaviour at the housing user stakeholder level.
- ii. Housing users' choice consideration for consequences and preferences focus solely on what is good for the housing user.
- iii. Societal influences play an important role in the choice of housing construction materials and methods among housing users.
- iv. Housing users believe that their legitimate and defensible preference requirements should be the primary consideration.
- v. Sustainable development issues do not play any role in housing users' choice of housing construction materials and methods, nor do they feel it should.
- vi. The need for housing users to act is referenced solely to the pursuit of their own personal benefits rather than in the pursuit of the general good.
- vii. Housing users distinguish between sustainable development changes that conflict with their requirements and sustainable development changes that support their requirements. This does not represent any aversion on the part of housing users to the requirements of sustainable development *per se*.
- viii. Housing users identify roles for the government and professionals in the duty to achieve sustainable development through housing production. They do not identify any role required of them in this regard.
- ix. Finally, housing users do not consider sustainable development issues to be so important that they override their own preferences.

These findings are useful for providing a fuller understanding of why housing users decide on the housing construction materials and methods that they choose as well as the place of sustainable development in these choice decisions.

However, it is also necessary to understand how housing users decide on the housing construction materials and methods that they choose. The decision processes of housing users with regard to their choice of materials and methods for housing construction can also be investigated using the data from the user group interviews. This analysis will be done using a coding process from the interview data.

6.3 Coding Analysis and Findings

The critical review of choice theory literature showed a range of observed decision processes exhibited under different choice situations, and this provides the tools for describing and understanding the observed housing users' behavioural processes. The aim of this section is to identify from the data any particular decision processes that are applied by housing users when faced with a choice of housing construction materials or methods. The data from the three interviews will be analysed using coding analysis in order to provide this information.

6.3.1 Multiple Rationales

The data from the interviews shows that the choice of housing materials and methods is a complex process involving many different considerations. This is what Kalai *et al* (2002) describe as rationalization by multiple rationales. The data has shown that in all of the groups, a range of different considerations were given as affecting choice of housing construction materials and methods. The data analysis shows that this is true for both the preferences of the choice agents and the consequences of the outcomes. The multiple consequences given in the data that go into the decision process for choice of housing construction materials and methods are cost, construction speed, availability of materials, durability and permanence, structural strength, low maintenance, quality of finishes, style, beauty and modernity. These outcomes do not have a 'common denominator' (Simon, 1955) but affect the choice process in different ways. The multiple preferences that the data contains include displaying or concealing wealth,

meeting one's individual taste, building for one's heirs, wanting the best, and the desire to live in the same type of houses found elsewhere.

The finding here is thus that the process of choosing housing construction materials and methods among housing users is based on multiple rationales.

6.3.2 Social determinacy of choice

The data is found to hold numerous references to the impact of the society on choice behaviour. For instance, this quote from one of the chamber of commerce participants:

It's a question of cultural preference, cultural value. What does the society consider to be important? So you have to meet up with the society's expectations.

A second example is taken from the market traders' discussion data:

But you want to build something modern, something civilized. If not, people pass comments and belittle you. You can't build a local house now.

A third example, from the civil servants' discussion group, states:

Fashion changes with time...So you want to build a house that is very fashionable and modern for its time. Just as you would not expect me to now to start building with a flat roof or a low roof.

These comments show that the effect of social influence is to determine whether a given housing construction technology would be considered by the participants. Numerous other examples in the data include references to the need to earn pride and prestige from the house one builds, the need to receive praise from others, and the desire to build houses that resemble those seen in other places.

One member of the civil service union goes on to state:

Then you also have to consider the individual taste of the person building the house.

Thus, the data indicates that the classification by social requirement is a first order process, as was described by Dietz and Stern (1995). It excludes certain materials and methods from consideration, thereby simplifying the choice process.

There is further evidence in the data that the users defer the consideration of options until such a time as they are known to meet these socially determined criteria. This is related to the fact that housing construction choices are complex and involved. As one participant commented: *'It takes years to build a house, so you have to be careful to get it right ... Everyone is looking at you when you build a house.'* There is evidence in the data that the participants are not prepared to engage unnecessarily in the contemplation of options. For instance, in relation to innovative materials, different participants from different groups state:

Maybe if some of these things start to be in fashion overseas, we will start to consider them.

We need to develop our local materials so that there will be alternatives to the materials we are currently using.

But it has to give me what I want. I need style, beauty. If it can give me all these things I will consider it.

This type of aversion to unnecessary contemplation of options was described in Ergin and Sarver (2010).

The major findings here are therefore that

- i. Social factors first classify the building materials and methods that will be considered before individual requirements and preferences are applied; and
- ii. The housing users are averse to considering materials and methods that are not known to have the attributes of the socially acceptable options.

6.3.3 The u, v procedure

Another choice process that the analysis of the data confirms to be evident during choice of housing construction materials and methods is a process known as the u, v procedure (Kalai *et al*, 2002). In this data, u represents the users' requirements and preferences while v represents wider concerns for others. From the data, it can be seen that when the vignette question introducing the idea of housing technologies that were

good for the economy and the environment was asked, the participants responses in all the groups show that their own preference requirements, u , supersede other considerations for the greater good, v . However, this is only where such requirements were perceived as conflicting with their own good as the quotation below demonstrates.

He is using his own money to build, so what he builds should be good for him.

However, where their own requirements, u , were perceived as being met by adopting choices that served the greater good, v , the data shows that consideration of the greater good would become an important consideration in their choice.

I wouldn't mind using a method that will be good for other people around me. Why should I mind to help my neighbour? But it has to give me what I want.

You have to demonstrate its cheap price and how durable it is and it will be adopted by people.

So the important thing is to show that it is aesthetically adequate, modern, et cetera, and people will not waste money on these expensive materials we are using now, and they will adopt it faster. Current materials may become obsolete.

This is classical u, v procedure, as described by Kalai *et al* (2002). The finding here is that the u, v procedure is one of the choice processes used by housing users when they are faced with a choice of housing construction materials and methods.

6.3.4 Ambiguity of preferences

It has already been shown in section 6.3.1 that a wide range of considerations go into housing users' choice of housing construction materials and methods. The data from the three organisations provides evidence that indicates that these preferences are managed in ways that do not maximize utility of stated preference. The data shows that all of the groups emphasised the importance of cost and affordability as a primary consideration in their choice of housing construction technology. Some examples from the data have already been shown. More include:

The first thing they want to know is the price or the cost of putting up the house. The biggest question is affordability.

The longer it takes you to build the house, the more expensive it is. Money and time are the two deciding factors during construction.

This would lead to the expectation that the cheapest and quickest options would be chosen. Rather, what is found further along in the conversations includes a range of references to the contrary. For instance, ‘*People want the best. You need to be able to take pride in your decision*’ appears to be prioritising other issues that might result in the selection of the more expensive option. Another example is this response, below, that was given in relation to the introduction of innovative housing construction technologies:

So the important thing is to show that it is aesthetically adequate, modern, et cetera, and people will not waste money on these expensive materials we are using now...

This shows that not only are other preference considerations given priority, but also that even the choice outcomes in current use are not in keeping with the emphasis placed on cost as the most important consideration.

The finding from the analysis of this data is therefore that preferences and goals for housing construction materials are not stable and precise and rational (in the classic sense), but have been shown to be suppressed or altered, resulting in ambiguity.

6.3.5 Status quo bias

Status quo bias has been described by Masatlioglu and Ok (2005) and Tversky and Khaneman (1981) as a high value placed on an option because it is the current choice. The data from the group interviews shows that housing technologies in current use are accorded a high value by the research participants at this stakeholder level.

No one looks around or tries to think of a new way of doing things, especially not with housing.

You want to build a low maintenance house ... modern houses made of block don't need so much maintenance.

Their house needs to be modern, forward-looking.

The data also shows that the respondents require that the advantages they perceive in these currently used technologies will need to be met and exceeded before any choice change will be considered. For instance, in response to the possibility of introducing laws that may require local building materials to be used:

No, I will not support new laws because we may not have the range of products that we get from outside.

The finding from this analysis is that status quo bias is one of the processes that is used when housing users take decisions on choice of housing construction materials and methods.

6.3.6 Dynamic aspiration levels

Another choice process that is evidenced in this data is what Simon (1955) describes as dynamic aspiration levels. This refers to the process of altering ones level of expectation, either upwards in order to reduce options and arrive at a unique choice solution, or downwards in order to guarantee a solution. The data from the civil service group contains the following:

... people lower quality in order to try to make building more affordable. For instance someone will increase the amount of sand he is mixing with cement to make blocks, just to reduce cost.

and

... many civil servants try to own their own home in spite of the difficulty and high cost. This results in their cutting corners and choosing substandard materials and methods because they are cheaper than the standard choices, but give them better hope of having a roof over their heads.

These are classic instances of lowered aspiration levels that serves to create a solution in a choice problem. The references in the data to changes in choice from the traditional house type to the modern house type are also evidence of dynamic aspiration levels, this time upwards, to create only one acceptable choice. The following example of raised expectation levels from the data from the chamber of commerce illustrates this point:

You have to put up a permanent structure. Your mud house, our local house, is not counted as a permanent domicile. I mean, say for instance you want to go into politics or you are made a chief, or you have an important occasion – your daughter wants to marry or like a burial and all these things. Many people will come to your house, so you have to have a permanent structure.

These serve as evidence from the data that dynamic aspiration levels is one of the processes involved in housing users' choice of housing construction materials and methods.

6.3.7 Imitation

March (1978) points out that while rationality requires figuring out the maximum utility or benefit, not all of people's choice processes involve calculations. He showed that there are other kinds of intelligence, such as learned behaviour or intuition, which do not involve any utility calculation. One such non-computational form of intelligence is imitation. Imitation is one of the choice processes for which evidence is found in the data. The data provides evidence that the process of imitation had been reported by the research participants. The quotes below from the different groups clearly show this:

And also it depends on the mentality of the person. Some people have strong mind. But not everyone can think for themselves and take independent decision regardless of what others think. Most people just follow the crowd and do what everyone else is doing.

Traditionally, everyone just does what everyone else is doing. No one looks around or tries to think of a new way of doing things, especially not with housing. But if others are doing it, people become interested.

Everybody uses the same thing to build their houses.

And when our young people travel to other places and come home, they want to sleep in the same type of houses that they saw outside.

Maybe if some of these things start to be in fashion overseas, we will start using them.

The finding from this analysis is that imitation plays a significant role in the choice decisions housing users make on housing construction technologies.

6.3.8 Melioration

Melioration is the term used by Herrnstein (1990) to describe a widely observed choice behaviour in which a given choice decision is not maintained over time but changes because the satisfaction gained from this choice reduces over time. The analysis of this data shows that melioration is in evidence in the data from the different organisations. Melioration can be seen in discussion on the traditional house type, which served for hundreds of years but was largely replaced by the modern house type.

You can't build a local house now. The houses suffer leakages, and if the leakage gets too much it will wash the walls and the walls will fall down ... You want to build a low maintenance house. Mud houses are high maintenance.

Melioration is also in evidence for any anticipated change of choice from the modern house type to sustainable developmental house types. It is evidenced by the discussion participant's expressed reduction in their satisfaction with the modern house type, to the point where a change is desired.

We are not using alternatives materials ... we need this kind of diversification.

There are, or there should be, alternatives.

We need to develop our local materials so that there will be alternatives to the materials we are using. The presence of such materials would be of great value.

Current materials may become obsolete.

The finding from this analysis, therefore, is that melioration is also one of the choice processes that determine the decision outcomes for choice of housing construction materials and methods among housing users.

6.3.9 Epistemic value of the menu

Another observed choice behavioural mechanism that leads to change in choice is described by Sen (1993) as ‘epistemic value of the menu’. This simply describes a choice process in which the availability of new choice options creates knowledge that produces change in choice outcome. In this data, the participants refer to awareness and the demonstration of advantages as being a central factor for change in the choice of housing construction materials and methods, as can be seen below:

The number one aspect is awareness. I have said it before – the number one aspect is awareness. You have to demonstrate its cheap price and how durable it is and people will ... embrace it faster.

Unfortunately there is no awareness in terms of diversification in materials and methods in Nigeria.

Well, of course using local materials will be cheaper than all this [sic] block.

And, with reference to the duty for sustainable development:

Number one, the professionals should come up with these materials and demonstrate their advantages.

Based on this analysis, it is one of the findings of this study that epistemic value of the menu is an important process in housing users’ choice of housing construction materials and methods.

6.3.10 Summary of the findings from the coding analysis

Coding was used to discover what decision processes could be found to be in operation from the data on the different housing user groups’ discussions. This analysis produced the findings listed below, which the data evidences as processes that are operational at the housing user stakeholder level during their choice of housing construction materials and methods:

- i. Rationalization by multiple rationales, where the data shows that a wide range of non-comparable requirements and preferences go into the choice.

- ii. Social determinacy of choice, where the data shows that societal influences create a first-order limit to the options to be considered. Furthermore, users are unwilling to consider options outside of this limit.
- iii. The u, v procedure, where the data shows that where housing users' requirements are not met, these requirements are the central dominant choice criteria and other considerations are ignored. However, where their requirements are satisfied, other sustainable development considerations may become the dominant choice criteria.
- iv. Ambiguity of preferences, where the data shows that stated preference is not always the maximised value.
- v. Status quo bias, where the data shows that outcomes are referenced to the qualities of current choices, and these qualities need to be exceeded for a change in choice to occur.
- vi. Dynamic aspirations levels, in which the data shows that, where necessary, users lower or raise their expectations in order to arrive at suitable choice outcomes.
- vii. Imitation, in which the data shows that many people's choices are simply based on what other people are using.
- viii. Melioration, in which the data shows that, over time, positive feedback from a current choice reduces and as a result, people change their choice or look for a change.
- ix. Epistemic value of the menu, in which the data shows that knowledge from new choices that become available can also produce a change in choices.

These findings are important because they provide a fuller understanding of how people choose the housing construction materials and methods that they choose at the user stakeholder level.

6.4 Theorising Housing Users' Choice Behaviour

The review of the literature in chapter 2 showed the need for a clearly defined theory on the choice behaviour of housing users in the field of housing production. Zhang and Canning (2011), Rid and Profet (2011), Scarpa and Willis (2010), Crabtree and Hes

(2009) and Melchert (2007) all make reference to different specific considerations on which housing users' choices are based, such as comfort, cost reduction or modernity. However, none of these studies attempts to explain these considerations at a theoretical level. In this section, the development of such a theory from the research findings will be discussed.

Through the use of qualitative research methods in the field, the choice determinants of housing users in the study area were articulated into robust data which has been analysed in order to contribute to a theory of choice behaviour of housing users for decisions on housing construction materials and methods. The preferences and outcome requirements of housing users provided the empirical basis for analysing the causal mechanisms that determine how and why choice decisions are made at this stakeholder level. Therefore, the findings from this data analysis provide an empirical basis for starting to build a theory of housing users' choice behaviour in the field of housing production.

Based on the data from this research, and employing general choice theory terms and concepts, this study submits the following law-like statements concerning choice behaviour among housing users for decisions on choice of housing construction materials and methods:

- A wide range of rationales, both for their own preferences and for the consequences of their choice outcomes, go into deciding what materials and methods housing users would choose for housing construction. These multiple rationales complicate the choice decision. However, these stakeholders have intuitive processes for simplifying the complexity.
- Social determinacy creates a first order simplification of the choice of housing construction materials and methods among housing users. Only materials and methods that are perceived to meet these social requirements fall within the considered set of options.
- Individual requirements also play a role in the housing user's choice decision, implemented through a number of choice processes:
 - a) Status quo bias – where the beneficial attributes of the current choice must be met and exceeded before a change in choice can be expected.
 - b) Imitation – where choice is based on what others are using.

- c) Melioration – where negative feedback, such as the high cost of the current house types in use, produce a desire for change.
 - d) Dynamic aspirations – where users raise their expectations in order to produce a unique housing construction solution, or lower their expectations in order to produce a possible housing construction solution.
 - e) Epistemic value of the menu – where the introduction of new options provides knowledge that makes the housing users alter their choice outcomes.
 - f) Ambiguity of preferences – where the housing users manage their preferences strategically.
- Cost considerations are of very high importance. While other considerations have been seen to override cost, the housing users consistently express cost as an important choice consideration.
 - All of the considerations of housing users have instrumental value for the good of the housing user rather than ethical value for the wider good. As Kraut (2007) points out, the judgement of good involves not only the question of how it is good, but also the question of who it is good for. Housing users values are all derived from an egoistic value orientation; the good they seek is the good of the users themselves. There was no evidence of altruistic or deontological tendencies in this data. The only value orientation found among housing users for their choice of housing construction materials and methods was egoism.

These statements are submitted here as a contribution to understanding and explaining the choice behaviour of housing users when faced with a decision problem for choice of housing construction materials and methods. This improved conceptual knowledge of the decision mechanisms of housing users for choice of housing construction materials and methods serves to enrich the literature on housing production and choice theory. Furthermore, it provides a theoretical basis for predicting choice outcomes in given contexts.

Can these findings be generalised beyond the studied population? Certain issues were identified in the analysis of the data that are specific to the study context. These issues concerned the references to the Ibibio vernacular house type found only in the region, as well as the hyperinflation that is a characteristic of the Nigerian economy.

Nevertheless, the analysis also showed that these context-specific issues did not distort the findings on how and why housing users arrive at decisions on housing construction materials and methods; the values and choice processes identified in this study do not show context specificity. The logic for the choice of the study area and the level of abstraction of the analysis of the data mean that the theoretical statements and other findings from this case of study can be generalised to other populations. It is submitted that egoistic values, social determinacy and the range of choice processes found in this study are expected to apply in understanding and predicting choice behaviour at the housing user stakeholder level universally.

As with all nascent theories, this theory on the choice behaviour of housing users can only be verified, refined or rejected through further testing in other contexts.

6.5 Housing Users and Sustainable Development

6.5.1 Sustainable development welfare requirements and housing users' preference requirements

In addition to contributing towards the building of a theory of choice behaviour in the field of housing construction at the housing user stakeholder level, this study also provides an empirical basis for understanding the relationship between housing users' choice requirements and the requirements of sustainable development for change. The housing users' values and preferences identified in this study have direct implications for the effort to advance sustainable development.

One important finding from the empirical study of housing users' choice mechanisms is that all of the considerations that determine their choice of housing construction materials and methods are external to the options themselves, a choice phenomenon that was identified and described in Sen (1993). At the user stakeholder level, it is not a case of 'x is better than y'. Rather, it is how instrumental an option is to achieving their requirements, which are external to and independent of the options. This finding is crucial because of its significance for changes in choice outcomes. As Sen (1993) points out, it is these external correspondences that create the basis for producing changes in choice, even sometimes to the point of reversal of choice.

A better understanding of the external correspondences on which housing users' choice is based is therefore crucial to the advancement of sustainable development because sustainable development is a requirement for change. This study finds that housing users' choice of housing construction materials and methods operates under an egoistic value system that prioritises their own good. This means that the benefits a housing technology may have for the environment or the economy is not relevant to housing users, unless and until the good of the housing users themselves have been satisfactorily achieved and demonstrated. What the study finds is that the environmental and economic concerns of sustainable development are outside of and secondary to the concerns and considerations that determine users' choices for housing construction materials and methods. The primary concern of users is for what is good for them.

Sustainable development, as we have seen, is an ethical and instrumental value theory that is based on equity principles; the good it seeks is the good of all. The findings from this study show that the equity concerns of sustainable development only become important to housing users after their own egoistic requirements have been satisfied. This is an operation of the u, v procedure described by Kalai et al (2002). Users' outcome and preference requirements – such as for durability, structural strength, low maintenance, prestige and beauty – are not to be compromised for the moral equity considerations of sustainable development. However, where the housing users' requirements are satisfied, wider considerations for the impact of their choice on the quality of life of others then become important choice considerations. As this study has shown, this is not a value system that is opposed to sustainable development values. Rather it is a value system that protects its autonomous rights to pursue its own good.

Furthermore from this study it is seen that:

- Housing users feel justified in making their egoistic requirements their priority and are prepared to defend their right to these considerations.
- Housing users do not consider sustainable development to be within their sphere of action.
- Housing users expect that progress towards sustainable development will result directly in additional benefits to them as housing users.

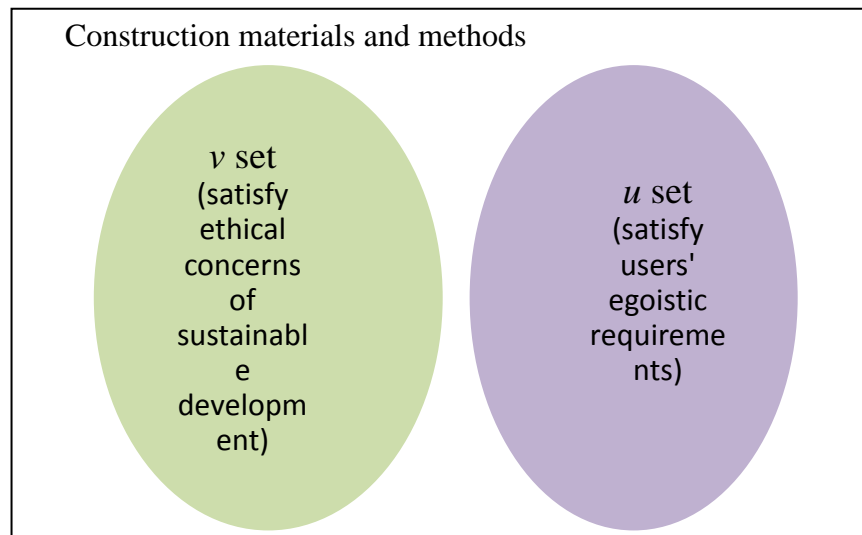
As Koebel (1999) points out, an understanding of the judgement criteria for innovations in housing construction technologies is essential if widespread adoption is to be achieved. Where sustainable development innovations are found to be inimical to the

housing users, widespread and spontaneous adoption cannot be expected. Where, on the other hand, sustainable development innovations result in additional benefits to the users, these innovations will be widely adopted. The finding from the empirical research is that resistance is not to sustainable development *per se*; rather the resistance is to harm: harm to the users and to their chosen preferences and outcomes.

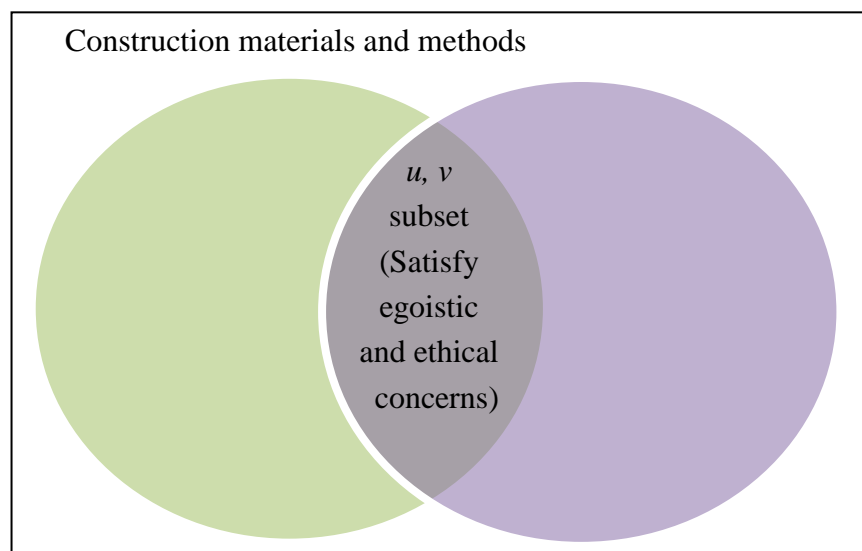
This finding differs fundamentally from what is found on users' values and sustainable development in the literature. For instance, Hay (2010) and Brown and Vergragt (2008) both hold that housing users need to change their egoistic values for sustainable development to advance in the field. While the present study agrees with Hay (2010) and Brown and Vergragt (2008) that an egoistic value orientation determines choice among housing users, it refutes their conclusion that these values are inimical to sustainable development and therefore need to be changed.

The findings also show, however, that the users anticipate that some of the housing materials and methods that are good for environmental sustainability and economic development will also be beneficial to them and instrumental to their own programmes and intentions. In particular, cost reduction is one benefit that they expect to result from changing to housing construction materials and methods that promote economic development and support environmental sustainability.

This study has shown that housing users' own needs remain their choice criteria as long as they feel that satisfying these needs is threatened. However, where their own needs are ensured, housing users can be expected to make requirements of sustainable development a selection criterion. This is known as the u, v procedure. The u, v procedure among housing users is shown graphically in figure 17 below. Where the choice set of housing technologies that meets the requirements of sustainable development is unique from the set that meets the housing users' requirements, housing users priorities egoistic u values. Where some housing construction technologies have been identified, from among the set that satisfies sustainable development requirements, that also satisfy the requirements of housing users, housing users then priorities v values.



Housing users prioritise the u value, irrespective of sustainable development impacts.



Housing users prioritise the v value from among the u set.

Figure 19: u, v procedure in housing users' choice behaviour

Based on the research findings, this study presents the u, v procedure shown in figure 19 as the propositional model of the relationship between the choice requirements of housing users and the change requirements of sustainable development. There was no evidence from the empirical data of deontological or altruistic values among the housing users, as Stern (2000) and others claimed, but there was evidence of the u, v procedure

and this therefore provides an empirically valid model of the choice behaviour of housing users as it relates to sustainable development. This study submits that this model provides a basis for developing a range of strategies to advance sustainable development in the field of housing production.

6.5.2. Sustainable development steering and housing users

The findings from this study show that the housing users' data highlights a distinction between selfish interests and self-interest. The findings also show that housing users believe they are justified in prioritising their self-interest. One question that arises from this discussion is: Are these egoistic requirements of housing users legitimate concerns with their own merit, or should they be overridden by the important welfare concerns of sustainable development? The reply to this question will be a crucial output from the results of this study that is expected to contribute to sustainable development policy.

The earlier discussion on value theory in chapter 3 plays an important role in providing a useful answer to the question of whether or not housing users' egoistic requirements should be upheld or overridden. Value theorists hold that the pursuit of autonomous egoistic preferences are indeed legitimate rights, and argue that political theories need to protect these rights. To ignore or override the egoistic concerns of housing users would effectively do them harm, impinge on their autonomous rights and provoke resistance. Sustainable development, as a normative, consequentialist theory, runs the risk of being perfectionist if it excludes all other states of affairs and defines only the state of affairs with which it is concerned (Kymlicka, 1988; Rawls, 2005). Sustainable development is concerned with the state of the global environment and the state of the local economy. The autonomous preferences and requirements of the housing users describes one state of affairs with which sustainable development is not concerned, but which the users, as stakeholders in housing construction, consider to be very important.

This means that it is not adequate for policy to state that housing construction should promote sustainable development, because this statement does not protect the autonomous rights of housing users. Hence, a deontological constraint is required in the neutral sustainable development value statement. Viz.:

Housing production should advance sustainable development without harm to the legitimate autonomous claims of housing users for their preferences and requirements.

This development of the neutral value sustainable development policy statement to include the protection of the rights of housing users is a contribution of this research to sustainable development policy. It recognises the need to protect the autonomous claims of the housing users for their own good, which the findings of the data analysis show are important to the housing users themselves.

It is important to distinguish this stipulation from being required to actually satisfy the autonomous needs of housing users, as many sustainability frameworks have been shown to embark upon (Campbell, 1996 and the 'triple bottom line', for instance), thereby obfuscating the requirements of sustainable development (Mebratu, 2006; Priemus, 2005; Lovell, 2004). Rather the implication of this deontological value statement is that it removes the perfectionist status of sustainable development as enforceable even where it is a clear source of harm to the housing users or requires sacrifices on their part. Any expensive or inconveniencing innovation developed in the name of sustainable development, for instance, would be unenforceable under this deontological value system; where there is a clash between the requirements of housing users and the requirements of sustainable development, sustainable development requirements would no longer override the good of the housing users.

6.5.3 *Sustainable development innovation and housing users*

This leads to the issue of conflict of values in the sustainable development effort. The findings from this study have shown that, where there is a conflict of interests, the housing users are prepared to resist action on steering for sustainable development in housing production. But the study has also found that the housing users expect a resolution between their requirements and sustainable development requirements, as the u, v procedure model shows.

If the u, v procedure is the relationship between the choice requirements of housing users and the change requirements of sustainable development, then resolution of conflict becomes an integral and essential part of advancing sustainable development in the field. Again, the earlier discussion on value theory serves to further this discussion;

it has shown how the suitable specification of ability-relative value statements provides the basis for resolving conflicts of interest through the use of innovation.

This study therefore deduces an additional function for innovation in sustainable development; the function of developing housing construction technologies that not only satisfy the ethical concerns of sustainable development but at the same time satisfy the egoistic concerns of the housing users. This goes beyond the efforts recorded in the literature of the multitude of sustainable development efforts that focus on only the requirements of environmental sustainability and economic development (such as Halliday, 2008; Thormak, 2006; O'Brien and Hes, 2008 or Stultz, 1688). The present study does, however, support the assertions by Koebel (1999), Guy and Shove (2000), Kaatz *et al.* (2005) and others who state that the requirements of housing users need to be incorporated into sustainable development.

Based on the findings of this study, the study therefore advocates the specification of an ability-relative value statement for innovation for sustainable development in the field of housing construction. The ability-relative value statement serves as a basis for re-designing housing construction materials and methods to incorporate both the requirements of housing users and the requirements of sustainable development.

6.5.4 Sustainable development action and housing users

Another important finding that emerged from this study was the absence of any user-specific roles for the promotion of sustainable development in the field of housing production; practitioners and government agencies were identified as the actors. This finding raises another important question: How can roles for sustainable development be better specified to reflect agency appropriately? The answer to this question will be a crucial output from the results of this study that will contribute to choice action for sustainable development in the field of housing construction.

Based on the findings of this empirical study on how housing users view sustainable development duties, it has become clear that action on sustainable development at the housing construction stage is agent specific to practitioners and government agencies. This means that neither focusing on the housing users in this regard, nor applying only the neutral value statement with no specified agency, can advance sustainable development in the field of housing construction. Indeed, agency is given here as being

more crucial to generating an obligation to act than the deterministic value-belief-norm model offered by Stern *et al.* (1999) and Stern (2000). They explained that personal obligation then produces actions, which are mediated by capabilities and constraints. However, the findings of the present study and the propositional model it suggests as representing the relationship between housing users choice behaviour for decisions on housing construction materials and methods and sustainable development indicate that preference and agency are the factors that mediate action for sustainable development in the field of housing construction in the choice behaviour of housing users (the equivalent of private-sphere behaviour). These findings also show that housing users do not accept sacrifices, which the value-belief-norm model argued were found to be accepted by the general public.

Failure to recognise agency is a major flaw in the logic of the value-belief-norm model. This study therefore indicates the need for a properly specified, appropriate agent-relative value statement for action on sustainable development in the field of housing construction. Based on the findings of this study, therefore, the next step in advancing sustainable development in the field of housing production would be to specify the appropriate agent-relative value for action on choice for achieving sustainable development at the construction stage, in addition to the ability-relative value for action on innovation.

6.6 Chapter Summation

The data from the group discussions by three housing user groups was analysed using thematic analysis and coding. The analyses provided empirical information on how and why housing users arrive at decisions on the construction materials and methods they choose for their housing, as well as how sustainable development fits into their choice. Based on these findings, this study began to build theoretical understandings of the inherent choice mechanisms of housing users. The results of the study show that

- Choice at the housing user stakeholder level is based on a wide range of egoistic considerations that are external to the actual choice options.
- Social requirements and personal preferences both play crucial roles.

- Several choice processes are used in the decision on choice of housing construction materials and methods. These include status quo bias; imitation; melioration; dynamic aspiration levels; epistemic value of the menu; and ambiguity of preferences. Many of these choice processes provide a basis for choice change, which makes them important to the effort to advance sustainable development.
- Cost plays an important role in housing users' choice decisions.

This contribution to a theory of choice mechanisms at the housing user stakeholder level is an original contribution to knowledge and is useful for understanding and predicting choice behaviour in the field of housing construction. The research findings also enabled the production of a propositional model of the relationship between housing users' choice requirements and the change requirements of sustainable development, defined by the u, v procedure. This propositional model is also an original contribution to knowledge in the field of housing production.

The findings from this data analysis also informed required changes to the value statements that inform sustainable development steering in order to protect housing users from harm to their autonomous rights:

Housing construction should promote sustainable development without harm to the legitimate autonomous claims of housing users for their preferences and requirements.

Finally, the results of the data analysis inform the need for the specification of

- An appropriate ability-relative value for innovation of sustainable development housing technologies to incorporate the requirements of housing users; and
- An appropriate agent-relative value for action on choice of housing technologies that promote economic development and support environmental sustainability to specify responsibility.

Chapter 7

Data Analysis and Discussion for Stakeholder Level II: HOUSING PRACTITIONERS

7.1 Introduction to the housing practitioners' data analysis

As was discussed in the methodology chapter provided in chapter 5, the data for the housing practitioners comes from questionnaire interviews as well as a group discussion interview, all with the members of the Akwa Ibom State chapter of the Nigeria Institute of Architects. The findings from the analysis of this data are presented here. The empirical research questions that guided the collection of data at the housing practitioner stakeholder level were:

- i. What values, principles and influences determine choice of housing construction materials and methods among housing practitioners in Uyo, Nigeria?
- ii. What is the relationship between these stakeholders' choice requirements and the requirements of sustainable development?
- iii. How important do housing practitioners in Uyo, Nigeria perceive sustainable development issues to be in relation to their choice of housing construction materials and methods?

In all, 41 questionnaires were completed and returned as reported in chapter 5, and these formed the questionnaire data set. The questionnaire data was coded and analysed using a combination of

- descriptive statistics from the SPSS statistical computer software suitable for the closed selection questions and
- qualitative coding suitable for the open-ended questions.

The coding frames are provided in appendix C.

Consequent to the analysis of the questionnaire data, a group discussion was held to further understand some of the findings emerging from there. Five architects participated at this group discussion interview. The data from this discussion was

analysed using thematic analysis and qualitative coding. The coding frame for this data analysis is provided in appendix D.

Together, these analyses provide answers to the empirical research questions. This chapter details the data analysis and the relevant findings that emerged. The analysis of the self-completion questionnaire interview data is provided in section 7.2. Section 7.3 provides the analysis of the iterative group discussion interview data. A nascent theory of housing practitioner choice behaviour is provided in section 7.4, while section 7.5 provides a discussion on the similarities and differences that are identified between the choice mechanisms of housing practitioners and the choice mechanisms of housing users. This chapter also provides a discussion on the relationship between sustainable development and the choice mechanisms of housing practitioners in section 7.6.

7.2 Questionnaire Data Analysis and Findings

The self-completion questionnaire used for the questionnaire interviews is provided in appendix C. The analysis is reported below in the order of the questions.

7.2.1 *Level of Importance of Sustainable Development Issues*

Questions 1.1 and 1.2 require respondents to rate the importance of eight sustainable development issues, four economic requirements and four environmental requirements of housing, that were developed from the sustainable development literature:

Housing should:

Use money efficiently	Minimize waste of materials
Retain money in the local economy	Avoid pollution
Use labour efficiently	Use energy efficiently
Provide jobs	Minimize CO ₂ emissions

In this way, question 1 introduces sustainable development, and its causal links with housing production, as it is conceptualised in this study. The relevance of placing this question first is that it ensures that the responses are not based on each individual's interpretation of sustainable development. This means that the responses to this and

subsequent questions are comparable to one another, relevant to sustainable development as it is defined in the study and reliable with regard to the subject matter in question. Furthermore, the economic domain (question 1.1) and the environmental domain (question 1.2) are given equal space in the questionnaire, as sustainable development theory would require. The economic domain is treated first, however, in order to counter any possible influence from the sustainability discourse, which has been shown to dominate in the field of housing production. The validity of the study is therefore strengthened by putting this question first.

This section provides an analysis of the responses to questions 1.1 and 1.2 in the questionnaire. Evaluation theory requires the specific of areas of performance to be focused on for the judgement as well as the criteria for judging be explicitly stated (Rossi *et al*, 2004). Questions 1.1 and 1.2 explicitly state the focus for sustainable development as it was developed from the literature and require participants to provide what they think would be a suitable level of importance for judging the impacts of housing construction technologies in their context.

According to Guba and Lincoln (1981) and Pawson and Tilley (2009), the main knowledge that the respondents would bring to the study, as practitioners in the field of housing production, includes a detailed knowledge of materials and methods as well as a good understanding of the context in which houses are built. Questions 1.1 and 1.2 were therefore aimed at revealing the human values (Guba and Lincoln, 1981), independent of housing construction options, on which the respondents think existing and proposed housing construction technologies are to be judged.

The four development issues and four environmental issues that affect sustainable development in the field of housing construction were used as components of the economic and social domains in the creation of the questions 1.1 and 1.2, using a 5-point Likert scale. The results of the modal analysis are shown in table 5 below.

Modal Statistics for economic issues

		Use money efficiently	Retain money in the local economy	Use labour efficiently	Provide jobs
N	Valid	41	41	41	41
	Missing	0	0	0	0
Mode		Very important	Very important	Very important	Very important

Modal Statistics for environmental issues

		Minimise waste of materials	Avoid polluting the environment	Use energy efficiently	Minimise CO2 emissions
N	Valid	41	41	41	41
	Missing	0	0	0	0
Mode		Very important	Very important	Very important	Very important

Table 5: *Modal statistics for 'Importance of sustainable development issues'*

As table 5 shows, 'very important' is the most typical level of importance accorded to each of these eight issues by the respondents. The frequency data is presented in the bar chart in Fig. 20 below.

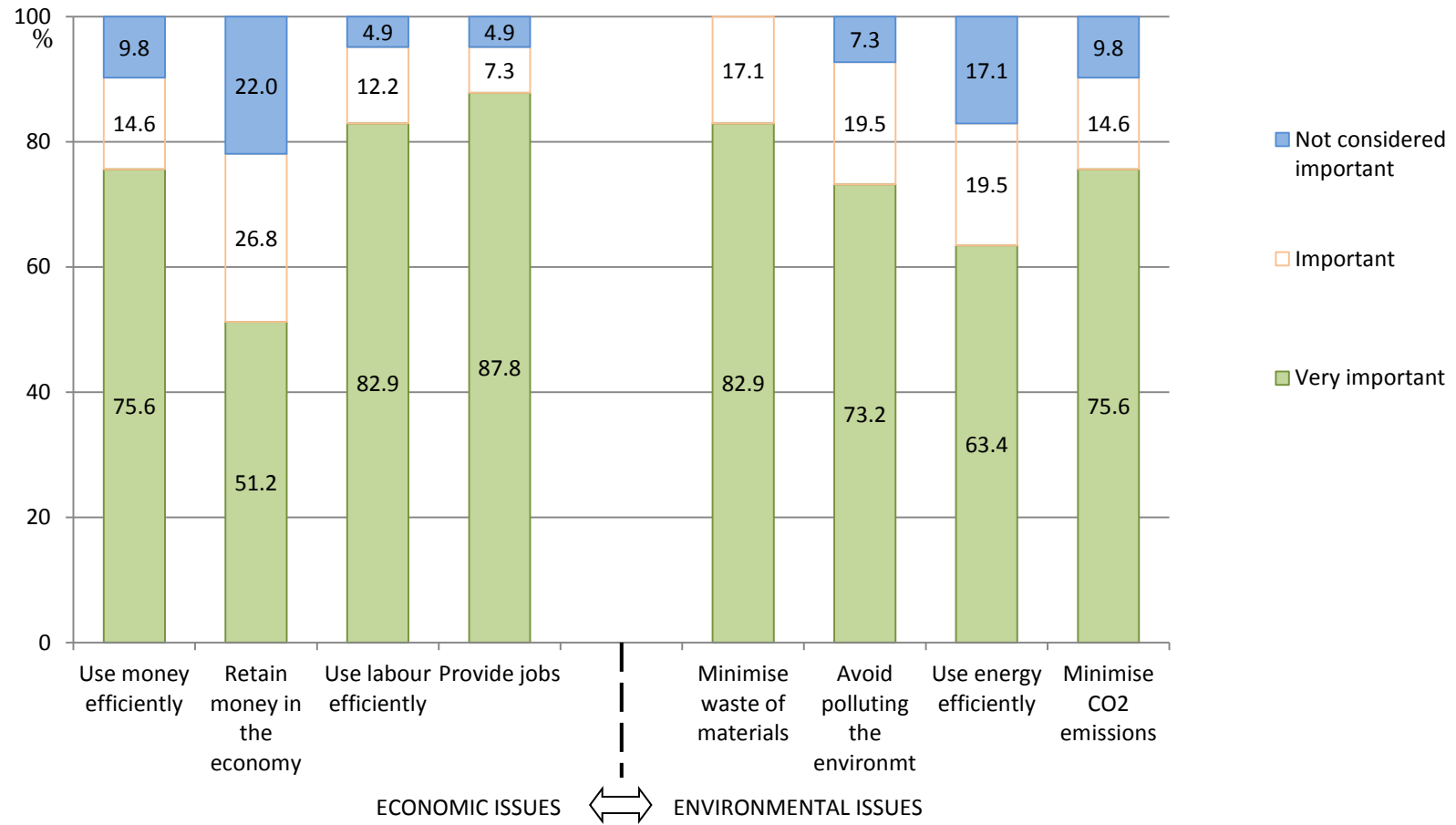


Figure 20: *Frequencies for 'Importance of sustainable development issues'*

The data in figure 20 shows clearly visible trends in the level of importance accorded to each issue. For six out of the eight issues presented, more than 70% of all respondents accord a high level of importance to achieving the proposed statement through housing construction, with three of these issues going over 80%. For the other two issues, there is much less consensus on the level of importance, with more than 19% of respondents holding that each issue is marginally important and another 17% or more holding that it is not important.

The data in figure 20 shows that for the issue of retaining money in the local economy, 22.0% of respondents felt it was not important and a further 26.8% took the neutral stand. Only 51.2% gave retention high importance in spite of the fact that retention from construction is said to have a strong impact on economic development as a result of the multiplier effect (Das, 2006; Tipple, 1995). Similarly, energy efficiency, which is often considered a central concern in the literature as well as in polity, was only accorded a high level of importance by 63.4% of the respondents. These results, differing as they do from what the literature would indicate, shows that the responses cannot be said to be skewed to what people feel they 'ought to' answer.

Among the economic issues, the data shows that the greater majority of respondents consider three economic factors to be of high importance: 75.6% for the efficient use of money; 82.9% for the efficient use of labour; and 87.8% for creation of jobs. However, only half of the respondents think retention is very important in relation to housing construction in the study area. One of the respondents that did give retention a high level of importance notes the phrase 'capital flight' on the questionnaire, and this phrase is seen again elsewhere in the data.

Environmental factors were also accorded high importance by the majority of the respondents. The data shows that 82.9% of respondents consider the reduction of waste to be important in their field and in their context. In fact, not one person considers this particular issue to be of low importance, while less than one-fifth of the respondents give it a middle rating. The need to minimize waste is the only one of the eight factors to have such a clear consensus. 73.2% think avoiding polluting the environment is very important; 63.4% accord a high importance to achieving energy efficiency during construction; and 75.6% of the respondents hold that it is important to reduce CO₂ emissions. One of the respondents, who gave a low level of importance for CO₂

emissions, noted that he expects that in the future this issue will take on greater importance.

Taken as absolutes, the finding here is that the respondents judge sustainable issues to be very important in housing production in their context. Further findings are revealed when this data is used for comparisons. Comparisons further serve the function of greatly reducing leniency error. Leniency error is a response style bias that has been found to be common in the Likert scale method which makes respondents give too high or too low ratings (Greenleaf, 1992; Phelps *et al.*, 1986). Comparisons of the data are analysed at two levels: between each of the eight individual sustainable development issues and between the two domains of economic development and environmental sustainability.

In the first instance, comparison between each of the issues is analysed. This data shows a clear consistency on what issues are judged more important than others. The data shows that the respondents collectively believe that labour issues are of higher importance to sustainable development than the use of money in the field of housing construction in this region. The data also indicates that minimising waste is of considerably greater importance in the collective view of the respondents than energy efficiency in this field. The frequencies for pollution and CO₂ emissions show similar high levels to those for efficient use of money in housing construction. The provision of jobs stands in the data as the issue that had the greatest consensus of responses (86.8% in one category) as well as being the issue that the most people felt was of high importance. The finding from this analysis is that the respondents do not accord equal importance to the different sustainable development issues.

In this regard, three issues stand out in this data. As has been shown, the data from questions 1.1 and 1.2 shows that the majority of the respondents consider most of the sustainable development issues to be important in their field and in their context. However two issues stand out after the analysis of this data as being of less importance: these are retention of money and energy efficiency. While over 73% of respondents accorded all the other six issues a very high importance level, only retention and energy efficiency fell below 64% of respondents who gave it a high level of importance. These two issues also recorded the highest proportion of respondents who describe them as unimportant, 22% and 17% respectively. In addition, the issue of waste stands out because it is the only issue for which not one of the respondents recorded it as being

unimportant. Further investigation of these three issues will produce further understanding of what is at issue for housing construction materials and methods at the housing practitioner stakeholder level.

In addition to comparing between issues, comparison of the data is also made between the two domains; economic and environmental. Using the aggregation of all the components of the two domains, as described in appendix C, the data is analysed to indicate, for each respondent, which domain is treated as more important. This data analysis is shown in figure 21 below.

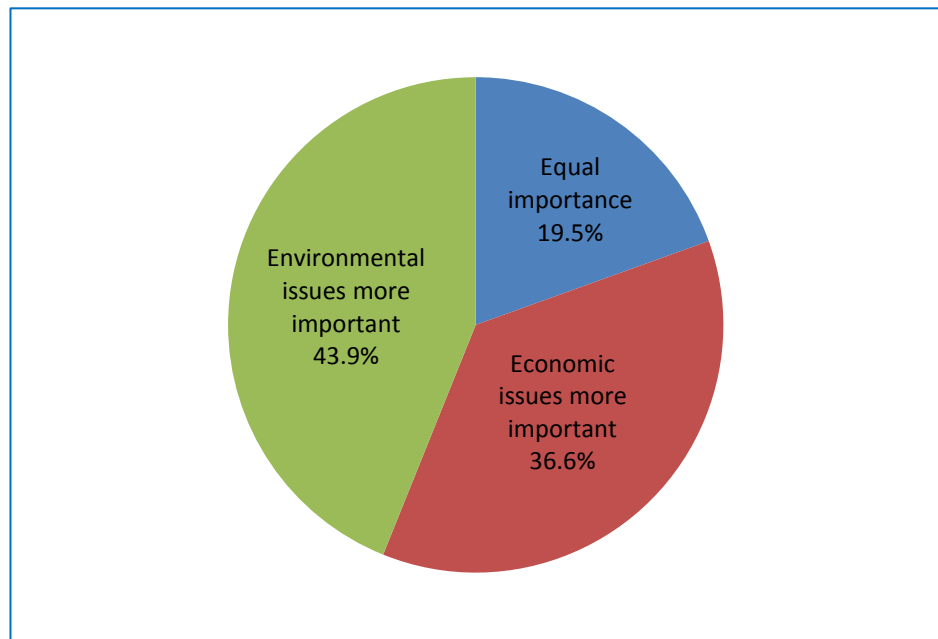


Figure 21: *Importance of environmental and economic domains for each respondent*

The data in figure 21 shows that while approximately one-fifth of the respondents treat the two domains as being of equal importance overall, 43.9% deem environmental issues to be of greater overall importance than environmental issues in the context of the study area. This means that 36.6%, approximately one third of the respondents, treat economic issues as being more important for housing construction than environmental issues in their context. No category stood out as being typical of this population from this data. The finding from this data analysis is therefore that, among housing practitioners, economic issues and environmental issues are, essentially, equally important.

7.2.2 Primary Duty

This section provides the analysis of the data from question 2.1, as shown in the questionnaire in appendix C. This question was designed to elicit data on who the respondents believe owes the primary duty to advance sustainable development through housing production. The identified stakeholders in the field of housing production constituted the three options. However, careful consideration of the choice of nomenclature resulted in the stakeholder groups being renamed to reflect the words used by the respondents: Hence housing users are here called clients; housing practitioners are here called building professionals; and policy makers are called government agencies. The results of the data analysis are shown in the mode and frequency tables provided in tables 6 and 7 below.

N	Valid	41
	Missing	0
Mode		Professionals

Table 6: Modal statistics for 'Primary duty'

		Frequency	Percent
Valid	Clients	1	2.4
	Professionals	22	53.7
	Government	17	41.5
	Other	1	2.4
	Total	41	100.0

Table 7: Frequencies for 'Primary duty'

The readily discernible trend showing in the data in table 7 is that the respondents' opinion of whom the primary duty for sustainable development falls to is split more or less between professionals and government agencies. Only two of the respondents did

not choose from among these two groups. One of these outliers chose the ‘clients’ option; and the second is coded as ‘other’ because he ticked all three options. These two outliers in this data are investigated more closely before the larger frequencies are discussed.

The first of these two respondents indicated that it is the client who should have the primary duty of advancing sustainable development in the field of building construction. However, his response to the question of what form the duty should take was:

Some jobs should deliberately be given to locals to check capital flight and build capacity.

This response means that the respondent is referring to a situation where the client is in charge of employing labour during construction. In effect he is treating the client as a building practitioner in this regard, according to how building practitioner level was defined for this study. This is a clear case of a contextual feature coming through to the data. In Nigeria, the client is often directly involved in the construction of his house as was discussed in chapter 4, and this is one of the features of the study area that made it particularly instrumental for answering the research questions. Incidentally, this is the second reference made to the term ‘capital flight’, a term describing the effect of failure to retain money in the local economy. This response is interesting and important and, as it stands, does not distort the findings from the data to any significant extent.

The second respondent ticked all the three options. This was another interesting response because it shows that this respondent believes that, in the end, sustainable development will not be advanced without the participation of all stakeholders. However, it does not serve to indicate the respondent’s view of who should have the primary duty, and it does not distort the findings from the data to any significant extent.

This data shows that at least 95.2% of the respondents think that the primary duty for sustainable development in the field of housing production does not reside with the client. This is an exceptional majority that is further strengthened by the above analysis of the other responses. This could therefore be said to be the thinking of this entire group. This analysis provides that finding that housing practitioner to not place the responsibility for advancing sustainable development in the field of housing production with the housing user. The data shows that the modal position is that professionals have the primary duty, with 53.7% of the respondents giving this response. This was closely

followed by 41.5% of the respondents, who indicate that government should have the primary duty of advancing sustainable development in this field.

Question 2.2 is an open-ended question that was designed to add depth to question 2.1 through an analysis of what the respondents think the required duty to sustainable development should entail. This qualitative data produces three lines of analysis.

- 1 Firstly, it provides a set of categories, derived from the data, for the forms of duty put forward.
- 2 Secondly, it provides data for the qualitative analysis of the issue of what respondents think the primary duty to sustainable development from housing construction should be.
- 3 Thirdly, it provides the value orientation category that the duty indicates, derived from value theory.

The coding frames explaining the coding for these three lines of analysis is provided in appendix C. It should be noted here that, based on the above qualitative analysis of the two outlying responses, the response that treated the client as a building practitioner has been recoded under the ‘building professional’ practitioner category.

The analyses of this data in question 2.2 support the findings from question 2.1 and also independently produce a number of significant findings.

The mode and frequencies for the type of duty is shown in tables 8 and 9 below.

Form of duty		
N	Valid	38
	Missing	3
Mode	Own initiative of professionals	

Table 8: Modal statistics for 'Form of duty'

Form of duty			Frequency	Valid Percent
Valid	Practitioners	Own initiative	14	36.8
		Govt control	7	18.5
	Government agencies	Legislation	8	21.0
		Govt support	4	10.6
		Govt research	1	2.6
	Multiple duties given	Includes legislation	3	7.9
		Does not include legislation	1	2.6
	Total			38
Missing			3	
Total			41	

Table 9: *Frequencies for 'Form of duty'*

The data in Table 9 exhibits a number of obvious trends. Three respondents left this question blank, which was expected based on the pilot study of the questionnaire in which open ended questions were not always filled. There is a clear conglomeration of responses around the first three categories in the list, own initiative; legislative control and government legislation with 36.8%, 18.5% and 21.0% of the responses respectively. These three categories of duty type account for a total of 76.3% of the responses.

Non-legislative action requiring the initiative of professionals is the highest single category of responses, representing the response of 36.8%, more than one-third of those who responded to this question. However, the legislative-based categories, when taken together, number more than the non-legislative based responses, a total of 39.5%. They are differentiated in the data on table 9 by whether the action expected is to originate from the agency making the rule or the professional obeying the rule, with an almost equal number of responses for each category. Three out of the four responses that include more than one duty mention legislation and regulation as one of the duties required, further increasing the number of legislative-based responses to 47.4%. While government support represents about 10% of the respondents, the remaining two categories represents less than 3% each, as the data in table 9 shows.

The findings from the quantitative analysis of this data include the following:

- i. A significant number of housing practitioners believe that professionals should take action on sustainable development even without any coercion.
- ii. A significant number of housing practitioners also expect legislation to play the central role in the effort to advance sustainable development.
- iii. A range of other issues are also identified by housing practitioners as playing an important role in the duty to sustainable development, such as research and government support.

Qualitative analysis of the data on question 2.2 serves to strengthen these findings and also reveals that none of the responses given indicates that there is any conflict between the values of the respondents and the requirements of sustainable development. From the data, it can be seen that several of the respondents are of the view that practitioners themselves are expected to perform the required duty in their field of their own volition, as a result of their agency, even without legislative controls from the government. The following four examples of responses to the question of what the duty to sustainable development entails illustrate this point:

Specification of locally available materials, simple non complicated design.

Ensuring that from the design stage through the construction process, sustainable materials are used.

A careful consideration of choice of materials and method of construction.

The building professional, by reason of training and experience is in the best position to advice and direct as regards suitability, sustainability, cost and practicality.

One of the responses in this category takes it a step further:

Government agencies have shown a lack of political will and physical capacity in promoting this goal. Building professionals are better disposed to identifying and promoting such practices and standards that enhance or contribute to the local economy through proper employment of resources.

This response shows that while the respondent understands that the government has a central role to play with regard to the issue, the professionals are ultimately responsible at this time as a result of their direct agency in the field, even without the necessary government input in the form of legislation or other support. Another response suggests that building professionals should begin to function as developers:

The building professionals should be empowered through mortgage institutions to undertake commercial housing delivery.

Taken as a duty to sustainable development, this response also shows that the respondent assumes that the building professional can be expected to uphold sustainable development values in the undertaking of housing delivery.

The most common type of response, however, has been shown to be responses that are based on the expectation that existing or new laws/rules will make the difference. Some call on government to enact such laws, as the responses below show:

By providing legislation.

Government agencies entrusted with legislation should ensure that favourable legislation to this issue see the light of day.

Others call on government agencies to uphold the existing or new laws vigilantly:

The duty is to ensure compliance to existing code of practice in relation to each discipline.

Formulation and enactment/enforcement of laws/byelaws that encourage practices that stimulate the local economy and the environment to regenerate itself: e.g. enforcing the planting of trees to every tree felled for construction purposes.

Others still call on professionals to be obedient to the law in order to ensure that sustainable development is achieved.

Abiding with the laid down procedures in terms of building byelaws and professional ethics.

Designing and specifying materials in accordance with policy and regulations that are in support of sustainable environment.

Several references are made to existing legislative regimes for controlling the construction of houses such as building byelaws and codes.

Other duties expected of government agencies in this data include: creating ‘*awareness of global environment*’; and provide ‘*funding*’, ‘*land and infrastructure*’ for housing development. One response included needed research required of professionals while another respondent expressed research as the duty of government agency. However, as discussed above, these responses were in the minority.

The finding from the above analysis is that housing practitioners identify the role of their agency in the field, the role of legislation and the role of other actions in the effort to advance sustainable development in the field of housing production.

One common trend that runs through this data is the lack of conflict between sustainable development values and the values of the respondents. Just as the data in section 7.2.1 above shows that the respondents consider all the sustainable development issues to be important, so also does the data in this section show that the respondents identify with sustainable development values and the need to act on them. A major finding from this analysis, then, is that there is no conflict between the values of housing practitioners and sustainable development values.

The qualitative analysis of the data also shows that while many responses were related to sustainable development implicitly or explicitly, some responses referenced the economic domain in particular, and others referenced the environmental domain. Examples of these are:

It would entail them putting some law in place to put embargo on importation of building materials, thereby encouraging our use of locally produced materials; our local economy will be boosted.

and

Employing sustainable (green) building measures, dimensional planning, environment friendly materials and methods.

Finally, several of the responses referenced issues outside of those outlined as sustainable development issues. For example:

Such duty would entail constructing according to set standards for comfort and safety and not according to clients’ wants.

In addition to comfort and safety given in the above example, some of the other issues mentioned that are outside the two domains of environmental sustainability and economic development include provision of land, funding and infrastructure by government and enforcement of quality standards and existing professional codes of conduct. Two issues arise from this data. Firstly, the reference to clients' wants could be argued to be referring to unjustifiable desires, as discussed in the previous chapter on housing users' choice mechanisms. Secondly, the inclusion of a range of other issues outside of the two domains of sustainable development could be related to the discussion developed in chapters 2 and 3 from the literature on the need to recognise that issues outside sustainable development are of import to stakeholders in the field.

The finding from this analysis is that housing practitioners consider environmental and economic issues to be important and that they also recognise and uphold the importance of other concerns outside of these two domains.

The analysis of the data on the form of duty expected by respondents further reveals whether the respondent's orientation of ethical value for action is based on a concern for consequences of the action or whether it is adherence to law that is considered to constitute ethical value. The analysis of the data from the value orientation categories is shown in tables 10 and 11 below.

Value Orientation		
N	Valid	38
	Missing	3
Mode		Concern for consequences

Table 10: *Modal statistics for 'Value orientation'*

Value orientation		Frequency	Valid Percent
Valid	Adherence to law	15	39.5
	Concern for consequences	20	52.6
	Both concerns	3	7.9
	Total	38	100.0
Missing	System	3	
Total		41	

Table 11: *Frequencies for 'Value orientation'*

The data presented in Table 11 shows that the number of people concerned about the consequences of actions is slightly more than the number of those whose response focuses on legislation and compliance. However, the difference is not significant. The finding from this data analysis, therefore, is that housing practitioners operate a value system that is based on a deontological response to duty and also appreciate the consequences of their actions, and that these values strengthen rather than conflict with one another.

The quotes previously provided above, during the discussion on legislation, serve to illustrate the value orientation that indicates a dutiful adherence to law. The following quotes from the data illustrate the consequential value orientation.

Some jobs should be deliberately given to locals to check capital flight and build capacity.

and

This would entail designing of buildings that are sustainable and energy efficient.

The quotation below provides an example of both concerns:

Formulation and enactment/enforcement of laws/byelaws that encourage practices that stimulate the local economy and the environment to regenerate itself: e.g. enforcing the planting of trees to every tree felled for construction purposes.

The finding from this analysis, therefore, is that housing practitioner exhibit both consequentialist and deontological (duty bound) value orientations.

7.2.3 Influencing Factors

Question 2.3 asks respondents to rate the level of influence a range of different factors would be likely to exert on their choice of housing construction technologies. These factors were taken from the literature review, and sustainable development considerations were presented in this list as ‘Obligation to the wider community’.

This section provides an analysis of the responses to question 2.3. This question generated data on the likelihood of specific factors influencing a change in choice outcome on a 3-point Likert scale. One respondent answered for only one of the factors, ‘Own interest in experimenting and learning new skills’, which was a strong influence. Another respondent answered for all the factors except for the first one, ‘Competitive or profitable advantage’. This explains the variations in missing data between factors in table 12 below. The data from question 2.3 was analysed statistically and the central tendency statistics is tabulated in table 12 below.

		Statistics						
		Profitable advantage	Client's request	Govt incentives	Adequate training	Interest in innovation	Technology becoming popular	Obligation to wider community
N	Valid	39	40	40	40	41	40	40
	Missing	2	1	1	1	0	1	1
Mode		Strong influence	Strong influence	Weak influence	Strong influence	Strong influence	Weak influence	Weak influence

Table 12: Modal statistics for 'Level of influence'

From this modal statistics presented in table 12, it can be seen that most respondents replied that four of the factors given would have a strong influence on their decision to use a new or unfamiliar material, while three factors would only have a weak influence. The four factors expected by most to exert a strong influence on their changing to a new material and method are competitive or profitable advantage; client’s request; adequate

training in the use of the material or method; and the practitioner's own interest in trying out new ideas.

The majority of respondents gave incentives from government, the popularity of the new technology and obligations to the wider community as the factors that were not likely to have a strong influence on their choice. The details of the frequencies of the level of influence given for each of the factors are provided in figure 22 below.

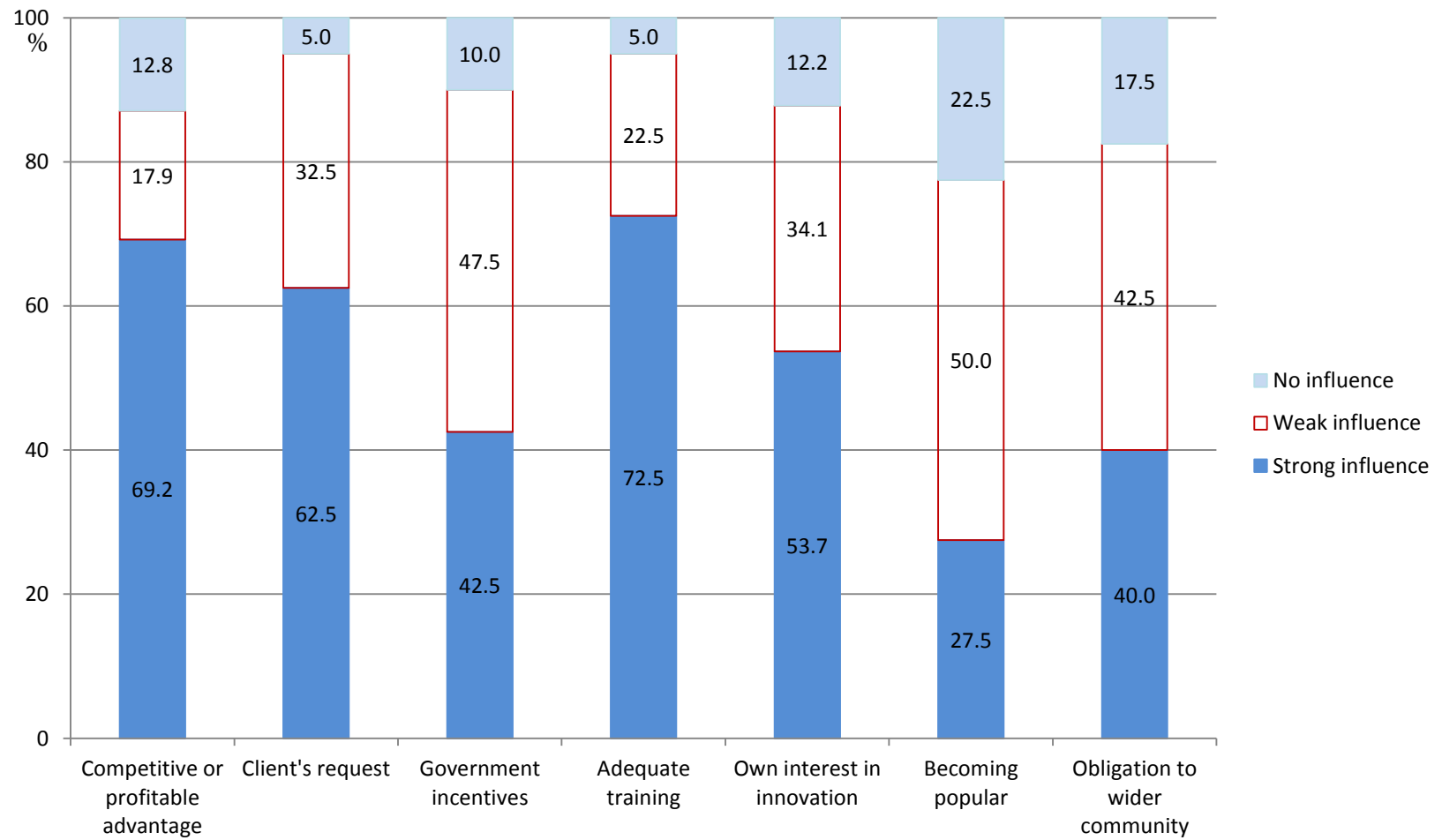


Figure 22: Frequency chart for 'Level of influence'

The frequency chart for this data reveals several trends. Firstly, adequate training is given as having a strong influence by the most number of respondents. More than 70% of the respondents give this factor as having a strong influence on their decision to use an innovative housing construction technology. Only 5% of them give this factor as having a weak influence. At the other end of the scale, half of the respondents give the popularity of the new technology as having a weak influence on their choice decision, with only about one quarter of them indicating that it would have a strong influence. Indeed this is the factor that was given as having no influence on their decision by the most number of respondents.

This data also shows that ‘competitive or profitable advantage’ and ‘client’s request’ would have a strong influence on a large proportion of the respondents, 69.2% and 62.5% respectively. Only 2 respondents reported that adequate training would have no influence over his decision, just as only 2 respondents reported client’s request as having no influence. This means that if strong and weak influences are taken together as meaning having an influence on decisions, then adequate training and client’s request are the factors that are given as having the strongest influence in this data (95% of respondents), followed closely by government incentives (90% of respondents).

The findings from this data are:

- i. Adequate training and professional advantages exert the most influence on housing practitioners’ decision to choose to use new or innovative housing construction technologies from among the options given. Clients’ request and government incentives also exert a strong influence on this decision.
- ii. The extent to which the technology becomes popular and obligations to the wider community are the factors in this list that exert the least influence on housing practitioners’ decision to use innovative technologies.

However, the complex nature of the question and the lack of qualitative data mean that the analysis does not have the level of depth that the other questions have. This analysis provides findings that would be further strengthened by a group discussion on the factors that influence choice change among the research participants.

The data on influencing factors was further analysed by organising the influencing factors themselves into three categories: those that represent professional development for the respondents; those that arise from the respondents’ primary obligation to their client or the

government; and those that arise from influences outside of those to which the respondents have primary obligation. This aggregation results in re-computing to give overall modes and frequencies, as is detailed in appendix C. Table 13 and figure 23 below show the statistical data from this analysis.

		Statistics		
		Level of influence from factors that enhance professional ability	Level of influence from primary duty sources	Level of influence from other sources
N	Valid	36	37	37
	Missing	3	2	2
Mode		Strong influence	Strong influence	Weak influence

Table 13: Modal statistics for 'Overall level of influence'

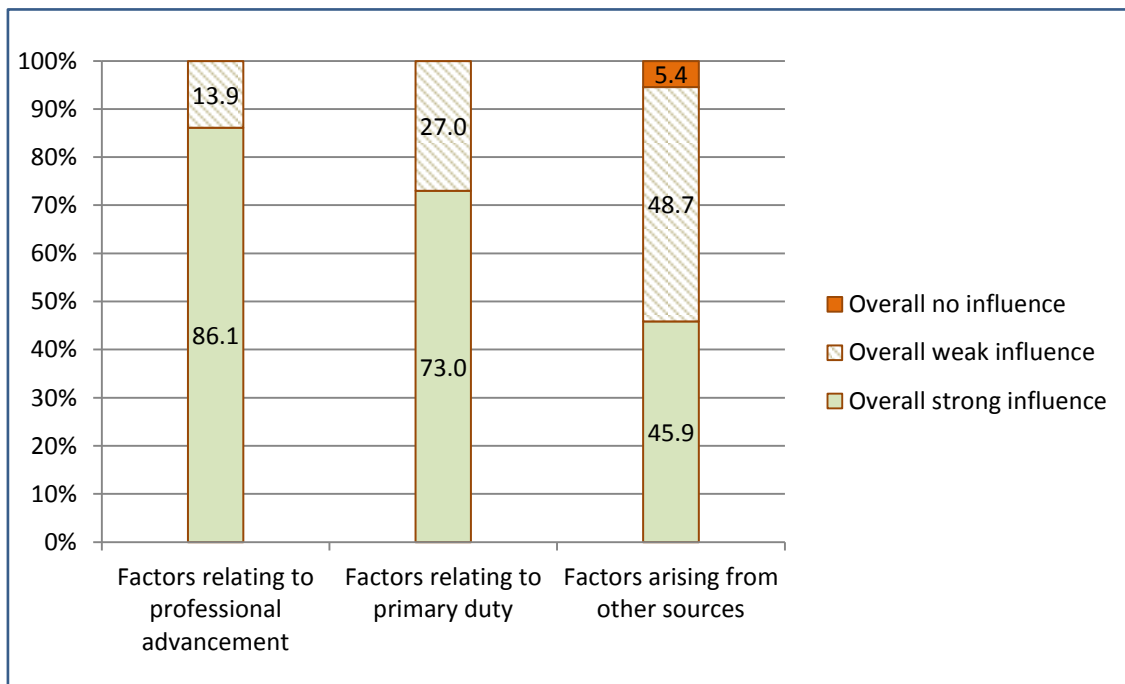


Figure 23: Frequencies for 'Overall level of influence'

The data in figure 23 clearly shows the difference in the levels of influence reported by the respondents when the source of influence is categorized in this way. The level of influence

from the factors that improve the professional ability of the respondent, such as training and competitive advantage have the highest overall influence on the highest number of respondents. The number of respondents for whom the overall level of influence from the clients and the government is strong is fewer, and fewest still from other sources. In fact, the data shows that for the majority of respondents, the factors from other sources, such as the wider community, have only a weak influence, and this is the only category in which, overall, some respondents reported no influence at all from any of the influencing factors in this category.

The findings from this data are that housing practitioners are most strongly influenced to use housing construction innovations by factors that relate to their professional advancement. They are least likely to be influenced by the level of popularity of the innovation or by concerns for the wider welfare of others.

7.2.4 Consideration of Sustainable Development Issues

Question 2.4 in the questionnaire requires respondents to state whether sustainable development considerations should be voluntary or mandatory in housing construction technology choice decisions and to give reasons why. The aim of this question was to indicate the level of importance that respondents accord to sustainable development in relation to their choice of housing construction materials and methods. The analysis in this section is on the data from responses to question 2.4.

Two respondents did not give any response to the question. Another two respondents state that sustainable development considerations should be both voluntary and mandatory. Table 14 and figure 24 below show the statistical data from the analysis of their responses.

Consideration of issues		
N	Valid	39
	Missing	2
Mode		Mandatory

Table 14: *Modal statistics for 'Consideration of sustainable development issues'*

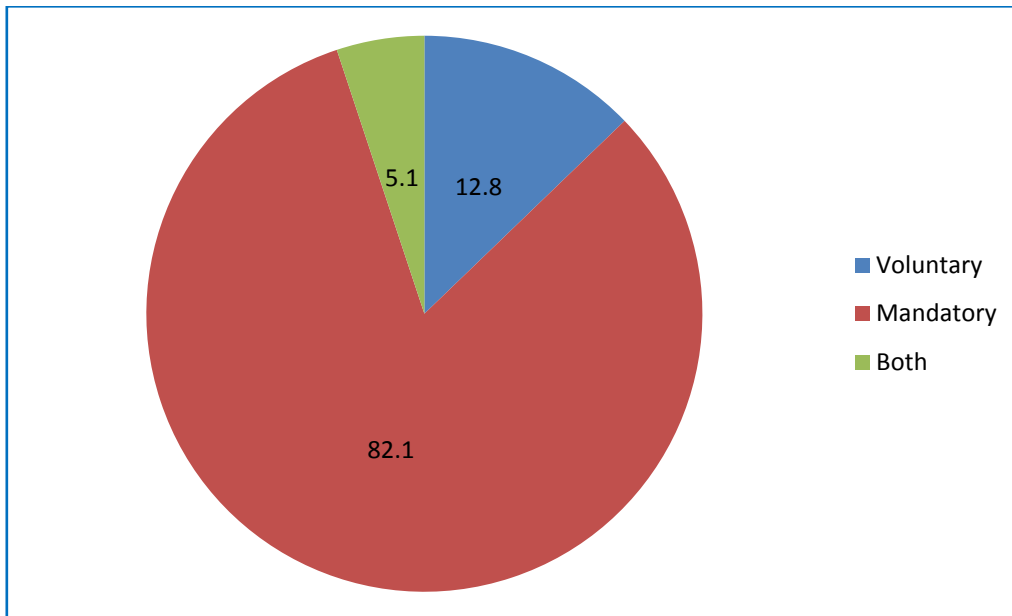


Figure 24: *Frequencies for 'Consideration of sustainable development issues'*

From the above data, it can be seen that the majority of respondents believe that sustainable development issues are so important that they should always be a consideration in the choice of housing construction materials and methods. Two types of reasons were given in the open-ended section of the question for requiring mandatory treatment of these issues.

1. The consequences of always choosing materials and methods that advance sustainable development, as can be seen from the responses below:

Sustainable development issues should be made compulsory, because it would be an advantage to both the economy and global environment.

It should be made compulsory so as to check unemployment as well as to check or eliminate climate related problems.

2. The added effectiveness of mandatory measures over voluntary ones, as illustrated in these quotes below, also taken from the data:

It should be mandatory because for sustainable development to work effectively improved construction methods and materials has to be involved (right choice of materials).

It should be compulsory for effective results in terms of sustainable development.

Should be mandatory. Reason is that much success would be recorded by this means. Government regulations would be an enforcing reason why many would comply with any sustainable development issues.

Should be mandatory. We react too slowly to issues that are voluntary in our environment.

From this analysis, it can be seen that the respondents support sustainable development and actively seek its advancement in the field of housing production.

The open-ended responses from some of those who chose the voluntary response show that even this selection cannot be translated to mean that they do not think that sustainable development is important. Rather, they choose the voluntary option because of practical issues. The data below highlights this point.

It should be voluntary because most of the materials that are experimenting are sometimes not to standard for sustainable development in housing industry.

It should be voluntary as the alternatives are not yet illegal. Our building codes still permit them. But there should be incentives or encouragement by government like tax holidays etc.

These responses show no conflict with sustainable development values. However, other responses in the ‘voluntary’ category show quite clearly that the respondents do not think that sustainable development concerns are important enough to override other considerations, as can be seen from the data below:

VOLUNTARY. It has to do with the taste and choice of individual building owners and availability of funds.

and

Should be voluntary because flexibility in decision is vital.

These responses indicate a need to retain control of the choice outcome. Similarly, an analysis of the responses that advocated for both voluntary and mandatory treatment of sustainable development in choice of housing construction technologies reveals that one respondent expresses this same kind of concern for maintaining professional control over the choice outcome, while still honouring the sustainable development value, as can be seen from the data below.

Both voluntary and mandatory. Voluntary because of my professional training and also mandatory because of good government policies for the populace.

The second response with both voluntary and mandatory elements reveals a practical concern about the state of preparedness of technologies that promote sustainable development, a response similar to one of those given above. Again, neither response can be said to be unsupportive of sustainable development values.

The findings from this data therefore are

- i. Housing practitioners consider sustainable development issues so important that they must be taken into consideration in the choice of housing construction materials and methods. This finding supports and extends the finding from question 1, in section 7.2.2, that housing practitioners believe that sustainable development issues are very important in their context.

- ii. Housing practitioners' values do not conflict with sustainable development values. Rather, housing practitioners uphold the welfare values of sustainable development and actively seek to advance its goals. This finding supports and extends the finding from section 7.2.2 on the values and responsibility of housing practitioners.
- iii. Housing practitioners have other important considerations that relate to both their professional requirements and the requirements of the client. This supports and extends the finding from question 2.2 (section 7.2.2) that housing practitioners have other concerns outside of the domains of environmental sustainability and economic development.

7.2.5 Live examples

The respondents were asked to give examples of incidences in their career when they have given consideration to any of the issues raised in question 1. The aim of this is to further support the findings so far and to confirm how the respondents translate the issues of sustainable development that were presented to them. One quarter of the respondents did not offer any response to this question.

The data from this question shows that the major issues considered were:

- Cost reduction and using money efficiently through choice of materials, reductions to building specifications and room sizes, programming of works and innovation (for example creating housing units out of abandoned freight containers).
- Using local labour in order to provide jobs.

Other examples given showed concern for energy efficiency through design and choice of materials; the efficient use of materials and labour; and concerns for the health of occupants and builders through the avoidance of asbestos based building materials.

The data from this question therefore confirms the findings that housing practitioners recognise their agency and take responsibility for action on sustainable development; the provision of labour as well as cost reduction are two very important factors to housing practitioners; and that housing practitioners seek to avoid harm.

7.2.6 Summary of the questionnaire data findings

The data from the questionnaires that were filled out by architects in the study area contained both closed choice and open-ended questions. This data was analysed quantitatively and qualitatively in order to provide a description of how and why choice decisions on housing construction materials and methods are made among this group, as well as the importance accorded to sustainable development issues and the place of these sustainable development issues in this choice. The analysis of the data produced a number of important findings which are summarised below.

- i. Housing practitioners consider all economic and environmental sustainable development issues that relate to housing construction materials and methods to be very important. However, they do not accord these issues equal importance.
- ii. Housing practitioners do not believe that the client has the primary duty to sustainable development in the field of housing production. Rather they expect that professionals and government agencies should act with regard to sustainable development but it is the housing practitioners that has agency to act in the field. Housing practitioners expect legislation to play a central role in achieving sustainable development through housing production. They also expect that, even in the absence of legislative requirement, housing practitioners should act to advance sustainable development in their field. Other important actions for the advancement of sustainable development identified by housing practitioners include research and awareness programmes.
- iii. There is no conflict between the values of the housing practitioners and sustainable development values. Housing practitioners exhibit both consequentialist values and deontological (duty based) values.
- iv. Housing practitioners are most strongly influenced to use housing construction innovations by factors that relate to their professional advancement. They are least likely to be influenced by social influences such as the level of popularity of the innovation or by concerns for the wider welfare of others.
- v. A significantly high proportion of housing practitioners want the consideration of sustainable development issues to be a mandatory factor in the choice of housing construction materials and methods for a variety of reasons. Other considerations are involved in this choice, and housing practitioners still require that they maintain control of the choice outcome.

The analysis of the questionnaire data provides an empirical basis for understanding why housing practitioners make the decisions they make on choice of housing construction materials and methods and how important they consider sustainable development to be. However, this data analysis also raised questions concerning the reason for the significant differences found in the level of importance accorded each sustainable development issue. More information was also sought on the factors that influence choice change among the respondents. For this reason, a reiterative interview was held with a group of architects in the study area. Further insight on housing practitioners' choice mechanisms, and the place of sustainable development in their choice, was gained from the analysis of this group discussion interview.

7.3 Group Discussion Interview Data Analysis and Findings

The following empirical questions arose from the analysis of the questionnaire data at the housing practitioner stakeholder level:

- i. What accounts for the differences in the level of importance accorded to each of the sustainable development issues among housing practitioners in Uyo, Nigeria?
- ii. What explains the influence of various factors on the decision by housing practitioners in Uyo, Nigeria to choose new or unfamiliar housing construction technologies?

7.3.1 Thematic Analysis

Based on the issues that arose from the analysis of the questionnaire data, a group discussion interview was held with the architects on the following themes:

- 1 Housing construction and retention of money in the local economy, which the architects themselves refer to with the phrase 'capital flight'.
- 2 Housing construction and waste of materials.
- 3 Housing construction and energy efficiency.
- 4 Factors that influence choice of housing construction materials and methods.

The first three themes arose from a comparative analysis of the data from the questionnaire as already discussed earlier: When eight identically presented issues were rated by the questionnaire respondents, the responses on these three issues stood out, as was seen in section 7.2.1. The fourth theme arose from the analysis of the data on factors that influence choice, and particularly choice change. It was observed that there was need for a fuller understanding of choice change considerations to complement the quantitative data.

These four themes provide the basis for the thematic analysis of the group discussion data from the housing practitioners. As was done with the group discussion data from the housing users, the data is organised and summarised using both Framework and coding. The Framework data analysis is provided in appendix D. The findings from the thematic analysis of these four themes are provided below.

Capital Flight

The data on the theme of capital flight is shown in the first column of the Framework in appendix D. Capital flight is on this list of themes because it was accorded the lowest importance of all the eight sustainable development issues given in the questionnaire. This low level of importance is significant because ‘very important’ was the modal level of importance accorded for all of the eight issues. The data shows that the participants are aware of capital flight occurring in the study area

Since construction materials are imported, this creates capital flight.

Foreign contractors and multinationals use expatriate staff, all their inputs are imported from their own home country, their cars, equipment, even the food they eat, are all brought from abroad.

What constitutes capital flight is that indigenous hands are not used.

Interestingly, capital flight was discussed in this data as an absence of choice.

Some things you can't control. If we have to meet up with construction technology, that is current technology, we have to go foreign.

Capital flight is stated as being on-going but it is also accepted as inevitable in the field of housing production in the study area because of the absence of suitable local alternative

choices. The finding from this data, therefore, is that capital flight is accorded a relatively low level of importance because of contextually peculiar conditions.

Waste of Materials

Waste of materials is on this list of themes because of the exceptionally high level of importance accorded to it in comparison to the other seven issues raised. It was the only one of all the issues which no questionnaire respondent considered to be of low importance. Furthermore, 82.9% of the respondents gave it a high importance rating, the second highest single consensus among all the ratings. The data on this theme is summarised in the 'waste of materials' column in the Framework in appendix D. Based on this data, again the participants can be seen to identify on-going waste on housing construction sites in the study area:

No quantity guidelines are used, so there's a lot of waste.

It is usually after the material comes to site, and sometimes even after it is installed, that the client can confirm its quality, colour, etc. Then if he doesn't like it, it results in waste.

The finding is that the housing practitioners' again reference an on-going problem that is of particular importance in the given context.

Energy efficiency

Energy efficiency, like capital flight, is on this list of themes because of the exceptionally low level of importance accorded it by the questionnaire respondents. Energy efficiency was seen to have had the lowest importance level among the environmental issues. The data on the theme of energy efficiency is in the third column of the Framework in appendix D. This data indicates two reasons why a relatively small number of the respondents think that energy efficiency in the field of housing construction is of high importance in their context. As can be seen from this data, the first reason is the tropical context in which the respondents practice. They expect that in the tropics, energy issues take on less importance than in temperate regions because achieving human comfort levels is easier in the tropics. For instance, one discussion participant states:

Where buildings need to be heated, in the cold regions, they have more concern for energy conservation. In the tropics, we don't have much problem in conservation of energy.

The second reason is temporal. Energy issues on site are stated as being different from energy issues in the stages before a building material comes to site:

Not much energy is used on site, but during manufacturing it may be high, like for cement.

The finding from this data, therefore, is that the relatively low level of importance accorded the issue of energy efficiency is also informed by the context as well as the way the stage of housing is interpreted.

Factors influencing choice change

Choice change has been shown to be crucial to the advancement of sustainable development in the field of housing construction. This question was therefore raised for discussion in order to enable the architects respond to the issue in their own words and thereby provide better understanding on this important issue. The data from the discussion arising from this question is summarised in the last column of the Framework in appendix D. The data shows that, in the first place, the architects identify issues that hamper their ability to choose. The issues that are given as hampering their ability to choose in this data are: the lack of available options both of materials and building methods; the lack of adequate funds or resources to experiment and try new technologies; and a lack of knowledge or awareness. These can be seen from the following quotations from the data.

Availability is first and foremost. Because we have limited choice, it's not hard to know what to use.

You also look at the working methods and equipment that are available to you.

Even when a new thing comes onto the market, we are careful because of resources. Housing costs a lot; we can't afford to take risks. Someone who has the resources can afford to experiment with the new material or method.

If you don't have much exposure, you will specify only what you see around. But if you attend building materials exhibitions or if you travel widely and see other ways of building, you may specify more and different materials and methods.

In addition, a quote from the discussion on energy further supports this point:

The research is not there, unlike in other places where the builders study more about materials and innovate new materials.

One finding from here, then, is that choice itself is hampered by other issues that override any influencing factors.

The data on this theme also serves to demonstrate the specific performance areas that the research participants' choice focuses on. It can be seen from the data that choice is not influenced by the impacts of housing construction materials and methods on the wider economy or environment. Rather, it is the traditional 'structure, function and aesthetics' paradigm that is evident. This is demonstrated in the following contributions to the discussion:

Or if you are designing a house in Victoria Island that is in a sandfilled area, the foundation requirements are quite different than for a stable soil.

Some clients may choose to use ceramic tiles to finish their house, while some others may choose marble.

This is in spite of the fact that the discussion up until this question had been about wider economic and environmental issues. When discussing the issue of choice of housing construction technology on their own terms and with their peers, the wider welfare issues of sustainable development did not come up. The second finding here, therefore, is that the areas of performance that are considered by housing practitioners in relation to choice of housing construction technologies do not include sustainable development impacts. This is in keeping with the findings from the analysis of the questionnaire interview data for this stakeholder level.

7.3.2 Summary of findings from the thematic analysis of the group discussion data

The data from the group discussion at the housing practitioner level was collected and analysed under four themes: capital flight; waste of materials; energy efficiency, and; the factors affecting choice of housing construction materials and methods, with particular reference to changing choice. This data provided empirical evidence of the following findings relating to choice mechanisms and sustainable development at the housing practitioner stakeholder level:

- i. Differences in the level of importance accorded to the different sustainable development issues by housing practitioners are a function of contextual features.
- ii. Housing practitioners are aware that their choices can be severely affected by other issues, such as lack of availability of suitable options.
- iii. The performance areas that the housing practitioners evaluate for choice decisions do not include the impacts of the building materials and methods on the economy or the environment.

7.3.3 Coding Analysis

The discussion data further provides information on a number of other issues that arise directly from the data itself through a coding analysis. These issues have a direct bearing on the research problem; they relate to how and why choices of housing construction materials and methods are made and the place of sustainable development in this choice. The four issues that arose from the coding of the data are: evidence of evaluation decision behaviour; unequal treatment of sustainable development impacts; the importance of avoiding harm; and context and agency in sustainable development and housing production.

These four issues are discussed below.

Evidence of evaluation

Just as the analysis of the data at the housing users' stakeholder level provided evidence of preference-based choice behaviour, an analysis of the data at this stakeholder level provides

evidence that evaluation is the decision process used by the discussion participants. The data shows numerous instances in which the participants' responses evidence evaluation processes.

A central characteristic of evaluation choice behaviour is that the performance of the entity itself, for a given performance area, is the basis for rational choice decisions. To put it another way 'x is preferred to y' means the same thing as 'x is better than y' with regard to the explicit criteria used for the evaluation. The data shows that the discussion participants base their choice of housing construction technologies on the performance of the housing technology itself. From the data, it can be seen that the discussion often refers directly to construction technologies as they perform in specific contexts. The data from the housing practitioners' group discussion shows the following instances of performance evaluation of the housing construction materials or methods themselves:

Because the choices are limited, we now focus on how to get it cheaper.

... for example a frame structure would have a different material from a loadbearing wall. I could even fill in the frame structure with paper.

... acid rain eats through metal roofs. So we used roofing tiles.

These instances show that choice is determined by an evaluation of the performance of the construction material or method in question for a specified performance area.

A second characteristic of evaluation was shown to be rational choice. This means, among other things, that causal links between the entity being evaluated and the desired outcome are clearly established. Instances of the discussants making clear links between the materials and methods used for housing construction and the impact such use has on the economy or the environment are found in the data from the practitioners' discussion, as presented below:

There are no indigenous building materials manufactured or produced here. Since construction materials are imported, this creates capital flight.

It is a concern because when you talk about the local industry, we use less energy to produce the same building, whereas multinationals use high energy machines, and methods which have high power needs.

Thirdly, evaluation involves two separate activities: the objective assessment of the entity's merit; and the contextual judgement of the entity's worth. The objective assessment of merit and the context-based judgement of worth are based on different criteria. The data shows a distinction between assessment of merit and judgement of worth of housing construction materials and methods, as can be seen below:

There are no indigenous building materials manufactured or produced here. Since construction materials are imported, this creates capital flight. Therefore, the materials we are using for construction are a direct source of capital flight.

The imbalance of capital flight is bad for a developing economy.

yet

If we have to meet up with construction technology, that is current technology, we have to go foreign.

Objectively, the use of imported foreign materials for housing construction is recognised by the discussants as a cause of capital flight, which is a failing in merit. However, in relation to that context, this was judged to be acceptable because it is the only source of modern local building materials.

This data analysis shows that all of the major characteristics of evaluation decision behaviour can be seen in the discussion data. The finding here, therefore, is that housing practitioners use evaluation processes for their choice of housing construction materials and methods.

Unequal treatment of embodied impacts

A study of the data on the discussion themes that centre on the impacts that housing construction materials and methods have on the environment and the economy show that the group discussion participants do not treat embodied impacts evenly across different issues. Three sustainable development impacts were raised in this discussion – capital flight, waste of materials and efficiency of energy usage. The embodied impacts would therefore include all of the capital flight, wastage or inefficiency involved with a material or construction method up until the completion of housing construction.

The data shows that when the issue of capital flight was discussed, all of the embodied capital flight was referred to without qualification:

Since construction materials are imported, this creates capital flight.

Foreign contractors and multinationals use expatriate staff, all their inputs are imported from their own home country, their cars, equipment, even the food they eat, are all brought from abroad

What constitutes capital flight is that indigenous hands are not used.

However, during the discussion on waste of materials, only the waste of materials that occurs on site is treated rather than the embodied waste:

Waste of time is another aspect of waste. It is the least considered, but time is very important on a building site, because it affects the funds.

When we talk of waste, it is also important to note that there is the issue of materials left over at the end of a project, which could be sold or used on another project site. This is a different issue from cut-offs, broken blocks and other materials that cannot be recovered for use.

The waste of materials embodied in the material before arrival on site is not referenced. This unequal treatment of embodied impacts is even more apparent in the discussion on the issue of energy efficiency. In this case, the discussion no longer referred to the construction stage at all; energy use during the building-in-use stage was the focus:

Our own environment doesn't cause us to think much about energy. Where buildings need to be heated, in the cold regions, they have more concern for energy conservation.

In the tropics, we don't have much problem in conservation of energy. We are just looking for something to bring down the temperature to comfort level.

There is no control of mechanical forms of cooling. People leave lights on, air conditioners on and go to work and come back.

Even where the researcher prompted the discussion to return to the construction stage, there was a further separation of energy used during manufacturing from energy use on site as seen in the data:

Not much energy is used on site, but during manufacturing it may be high, like for cement.

The finding from this analysis therefore is that housing practitioners do not always treat sustainable development issues objectively.

Harm to housing users

The coding analysis of the data also shows that practitioners place great importance in avoiding harm to housing users. The iterative study of the single issue that had the highest importance rating among all the eight issues from the questionnaire data shows that the discussion on this issue focuses on harm to the housing user. In the discussion, the issue of waste of materials as an environmental impact raised more concern as a negative cost element to the client:

Waste is a cost loss to the client, or a reduction of the profit margin. Also, higher costs may make the builder resort to using low quality materials, in order to meet the budget for the project.

In fact, the environmental aspect is not the consideration. Waste is more of a cost concern.

Waste of materials is identified as being synonymous with harm to the client. The finding from this analysis, therefore, is that where harm to the client is evident, the issue takes on greater importance to housing practitioners. This is not surprising, considering the duty that the respondents owe their clients as a result of the special relationship that exists between them, as described in McNaughton and Rawling (1995a).

Furthermore, the data shows that reducing cost is itself an important concern. In addition to the instances discussed above, the need to reduce cost also came up in the discussion on factors influencing choice:

Because the choices are limited, we now focus on how to get it cheaper.

These lead to the finding that housing practitioners, like housing users, give the issue of cost reduction a high level of importance in their choice of housing construction materials and methods.

Context and agency

Context has been shown to explain the differences in the level of importance accorded sustainable development issues. The data on this discussion makes several references to temporal and spatial contexts during the discussion. Context in this data is also related to the manner in which sustainable development issues are discussed.

To explain, the present study identifies three stages of housing: housing production; building in use; and decommissioning. The focus of this study is on the housing production stage. The data on the architects' group discussion, however, independently introduces two other temporal stages in relation to sustainable development impacts. One of them is the building-in-use stage. The data is found to consider energy needs for running the house as is shown in the data already quoted above and in the following:

To stabilise the temperature, you need mechanical cooling, like you can see in this place we are using now. Fans, air conditioners, electrical appliances are used.

The second temporal stage referenced in the data is even more interesting because it breaks the housing production stage down into its constituent parts – the manufacturing stage as distinct from the stage of site work. This is evidenced in the data shown below:

Not much energy is used on site, but during manufacturing it may be high, like for cement.

as quoted earlier, and

It is not a concern for the builder, because of the disconnect between site workers and manufacturers of building materials.

Similarly, the data shows that the participants refer to the spatial context when they discuss differences in energy usage in the temperate regions and the tropical regions of the world, as the data that has also been quoted earlier clearly shows.

The discussion participants relate agency to the spatial and temporal context, as is also evidenced in the data presented below:

Our own environment doesn't cause us to think much about energy. Where buildings need to be heated, in the cold regions, they have more concern for energy conservation.

The building team has not applied themselves to issues of energy use for manufacturing. The manufacturers may be concerned, they may be trying to control energy use, or they simply add the cost on to the client.

The finding from this data, therefore, is that housing practitioners recognise that spatial and temporal context determines agency for sustainable development in the field.

7.3.4 Summary of findings from the coding analysis

Coding analysis of the data from the housing practitioners' discussion leads to a number of findings on issues that emerge from the data. These findings are summarised below.

- i. Evaluation processes are employed in the choice mechanisms of the housing practitioners.
- ii. Housing practitioners do not automatically treat all sustainable development impacts objectively.
- iii. Housing practitioners consider avoiding harm to housing users to be a key concern, particularly avoiding extra costs.
- iv. Housing practitioners explain some of the variations in the level of importance accorded to the sustainable development issues using temporal and spatial contextual features. They also use temporal and spatial context to determine agency for sustainable development.

7.4 Theorising Housing Practitioners' Choice Behaviour

As discussed earlier, choice mechanisms explain choice behaviour. Choice mechanisms are comprised of the processes, values and influences that determine choice outcomes. As a result of the present empirical study and the findings from the analyses of the data, it is now possible to discuss what the study has revealed about the choice mechanisms of housing practitioners. The analysis of the data confirmed that the decision process of housing practitioners for choice of housing construction materials and methods is rational and uses separate criteria for assessing the objective merit and determining the context specific worth

of housing construction materials and methods, based on their performance. Explicitly stated performance areas are employed by housing practitioners in their evaluation processes. These all indicate classical evaluation behaviour. Thus, this study finds that housing practitioners employ evaluation choice processes for choosing from among housing construction technology options.

The question of why they arrive at given decisions on choice of housing construction materials and methods is also evident from the data analysis. Evaluation theory explains that the role of values and influences in evaluation is to determine what specific performance areas are used as evaluation criteria in the evaluations that inform choice (Owen and Rogers, 1999; Ruddock, 1981). The analysis of the data from the housing practitioners found that sustainable development issues were not included in the performance criteria on which the performance of housing construction materials and methods were evaluated. Choice decisions were based on performance areas related to the more traditional professional values of structure, function and aesthetics of the houses themselves and the good of the users of the houses. Concerns for the wider economy or the global environment were found not to be involved in housing practitioners' choice decisions. This finding reflects the assertion made by Marsh (2011) that the production of housing cannot be reduced to the problem of putting together sustainable construction technologies.

This conclusion, derived from empirical evidence, that housing practitioners do not base their performance evaluation on sustainable development considerations perhaps explains the assertions found in the literature which state that housing practitioners are yet to alter their values to sustainable development values in the field of housing production (Hay, 2010; Jorgensen *et al.*, 2009). These assertions in the literature have arisen from studies undertaken in areas where sustainable development regimes are in operation. The present study provides empirical evidence that confirms that wider concerns, such as the welfare concerns for economic development and environmental sustainability, are not found to be the values that determine the performance criteria on which housing practitioners' choice decisions are based.

The question of generalizability of these findings needs to be addressed at this point. The research was deliberately conducted in a context that does not have any overt sustainable development regime in operation in the field of housing construction, but the findings are presented as the inherent choice behaviour of all housing practitioners. It is perhaps not in

question whether housing practitioners everywhere use performance evaluation processes to choose housing construction materials and methods, nor is it new to say that traditional, pre-sustainable development professional considerations, such as structure and function, are the performance areas that are evaluated for these choice decisions. The real question that arises from this study is: In parts of the world where strong sustainable development regimes are in operation, do housing practitioners still base their choice decision on these traditional performance criteria? In other words, are these findings universal? This study holds that they are.

Housing practitioners are, by definition, engaged in the work of creating housing. The findings from this study show that the choice mechanisms of housing practitioners operate through performance evaluation processes, and that the performance criteria used for the evaluation are related to the housing they create. This study concludes that wider welfare concerns such as sustainable development do not alter the performance criteria on which housing practitioners base their choice of housing construction materials and methods because of their stable professional values for the houses they produce and the housing users they produce them for. Again, as it was for the claims on housing users' choice behaviour, this exploratory claim about the choice behaviour of housing practitioners is subject to testing in other contexts.

7.5 Housing Practitioners and Housing Users

The findings from this study also provide important insights into the similarities and differences between housing practitioners' choice mechanisms and housing users' choice mechanisms for choice of housing construction materials and methods, particularly in relation to sustainable development.

Firstly, data analysis has shown that housing users focus their choice criteria for housing construction options on what is good for them, based on their preferences and the requirements the society makes of them. This is unlike the housing practitioners, whose concern is for what is good for the building as well as what is good for the housing user. However, this means that like the housing users, housing practitioners do not base their

choice of housing construction materials and methods on sustainable development values and concerns.

Secondly, the housing practitioners, like the housing users, believe that the primary duty to sustainable development in the field of housing construction does not lie with the housing user. One finding from the analysis of the housing users' data was that housing users identify roles for the government and for housing practitioners with regard to advancing sustainable development in the field of housing production. The findings from the housing practitioners match this conclusion precisely. This study shows that housing practitioners feel that, as a result of their agency in the field of housing construction, they have a direct responsibility to sustainable development which requires them to act. Housing practitioners were also found to highlight the role of government action in the form of legislative and other processes for sustainable development.

Thirdly, housing practitioners, like housing users, place a high premium on avoiding harm to housing users. And, like with the housing users, avoiding high costs is considered to be very important in their choice decision making. These findings are significant because they endorse one of the main conclusions from the investigation into housing users and sustainable development, which was that housing users should be protected from harm. This further supports the universality of the deontological stipulation for the sustainable development value statement in housing production that has been developed in this study. This was an inclusion of the stipulation to avoid harm to the housing user, and these findings on housing practitioners' choice mechanisms uphold this deontological stipulation.

Finally, this study finds that housing users and housing practitioners operate under very different value orientations when it comes to choosing housing construction technologies. In chapter 6, it was shown that housing users are egoistic, and this value orientation makes it possible for them to be willing to consider housing construction technologies that are good for them, regardless of their effect on the economy and the environment. Housing practitioners occupy a completely different value realm in this regard. The findings from the data on housing practitioners describe the values of housing practitioners as consequentialist and deontological.

From the study of value of theory, it was shown that deontologists observe consequentialist normative values with the extra deontological stipulation of avoiding harm to people. The high level of importance that the housing practitioners accord to sustainable development

issues, the duties to sustainable development that they identify and their assertion that sustainable development issues should be a mandatory consideration in the choice of housing construction technologies all indicate that housing practitioners, unlike housing users, are not willing to overlook the impact on the economy or the environment that their choices have. The findings here show that housing practitioners consider it very important that housing production contribute to developing the local economy and sustaining the global environment. They also show that housing practitioners want to avoid doing harm and to abide by rules designed to protect others from harm.

Agent relative values were discussed in chapter 3 under value theory and again in chapter 6 in relation to the findings from the analysis of housing users' choice behaviour. The analysis of the choice behaviour of housing practitioners undertaken in the current chapter confirms that housing users do not have agency for choice of construction technologies that satisfy the requirements of sustainable development. The agency in the field is identified as residing with the housing practitioners. This further confirms that housing practitioners have the responsibility to choose housing construction materials and methods that advance sustainable development on account of their agency in the field of housing production. This again confirms the need to specify the agent relative value for action to stipulate the housing practitioner as the agent in this regard.

In essence, the values and the processes by which housing practitioners' choice decisions are reached are fundamentally different from those of housing users. This means that the relationship identified in chapter 6 between housing users and sustainable development is fundamentally different from the relationship between housing practitioners and sustainable development.

7.6 Housing Practitioners and Sustainable Development

7.6.1 Housing practitioners' values and sustainable development values

Sustainable development has been shown to be an important welfare concern that is directly impacted by housing construction materials and methods. Sustainable development therefore requires that the housing construction technologies we use promote economic development

and support environmental sustainability. The study has already identified, from the literature, that these equity welfare values are synonymous with the values of governments and their agencies. The study has also identified, from the empirical research findings, the nature of the relationship between the egoistic values of housing users and the welfare requirements of sustainable development. One of the central aims of this study was also to establish the relationship between the choice mechanisms of housing practitioners and sustainable development welfare values.

This study has established from empirical research what the choice mechanisms of housing practitioners are, and how important sustainable development is to them in their choice. It is now possible to discuss the nature of the relationship between housing practitioners' values and sustainable development values, based on this increased conceptual understanding that has been developed from this empirical study of how and why housing practitioners arrive at choice decisions.

This study established empirically that most housing practitioners consider all of the sustainable development issues to be very important, and that it is just as important to treat economic issues as it is to treat environmental issues. The findings have also shown that housing practitioners actively seek to uphold sustainable development values. Furthermore, the data analysis also led to the conclusion that housing practitioners have a deontological value system, which makes them avoid harm to others. Sustainable development seeks to avoid harm to others, based on its equity principles for protecting the welfare of all. Thus sustainable development appeals directly to the inherent deontological value system of housing practitioners.

The present study has also shown empirically, however, that these sustainable development issues do not form part of the evaluation criteria on which the housing practitioners' decisions are based for choice of housing construction materials and methods. Their values lead them to focus on the needs of the building and the housing users. What then do all these findings show to be the relationship between the choice mechanisms of the housing practitioners and the welfare requirements of sustainable development?

One indicator of the nature of this relationship is the significantly large proportion of housing practitioners that propose that the treatment of sustainable development issues be mandatory. Furthermore, approximately half of the housing practitioners proposed that sustainable development laws be promulgated and adhered to, much like any other building regulation;

and others still felt that housing practitioners should treat sustainable development issues even in the absence of the relevant legislation. These findings mean that the housing practitioners believe that housing construction technologies that do not satisfy the requirements for sustainable development should not be used. Minimum performance requirements are specified, and these must be satisfied before a construction technology is even considered by the housing practitioner for evaluation based on their professional requirements. Plott (1976) and Seabright (1989) discuss this kind of choice behaviour as arising from the need to choose based on welfare based metaprinciples, while Kalai *et al.* (2002) treat the same type of choice behaviour in relation grouping and choosing from a preferred group where there is the need to choose based on multiple criteria. This is effectively a pre-selection function, of the kind seen in existing building codes.

Whether the government requires this pre-selection of them through sustainable development legislation or whether they require it of themselves as a professional duty, either way, housing practitioners have shown that they believe that it is required that materials and methods used for housing construction meet the requirements of sustainable development. With this process, the choice of the housing practitioner comes from within a feasible choice set, necessarily limited to only those housing construction materials and methods that are known to promote economic development and support environmental sustainability. This conclusion provides the empirical basis for a propositional model of the relationship between housing practitioners' choice requirements and sustainable development. This relationship is shown graphically in fig 25 below.

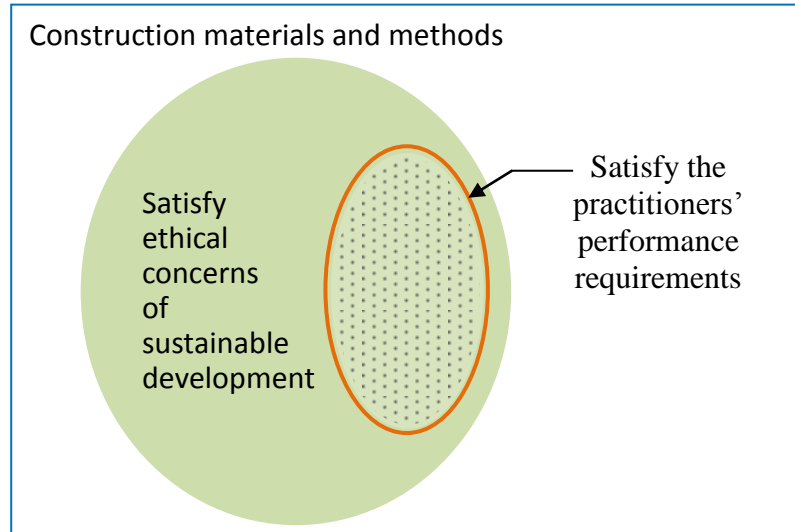


Figure 25: *Feasible choice set in housing practitioners' choice behaviour*

In this way, the housing practitioners are still able to maintain control of the choice outcome, as this study shows they require, by focusing their evaluation on those performance areas that relate to the professional needs of the building and its users while having met the important, and mandatory, welfare requirements of sustainable development. This study concludes, based on its findings, that this feasible choice set defines the relationship between housing practitioners' choice mechanisms and sustainable development requirements.

This relationship is similar to that described by Plott (1976), as reviewed earlier in chapter 3, in which the feasible set of options, v' , is defined by a metaprinciple. Plott (1976) describes the contender set, v , as being from within this feasible set. In this case, sustainable development is the metaprinciple that defines the feasible set of suitable housing construction technologies by the impacts they have on economic development and environmental sustainability. The contender set here is those housing technologies that meet the professional performance requirements for the house from within this feasible set.

7.6.2 Ability, housing practitioners and sustainable development

From the findings of this empirical study, it was seen that a range of factors affect the ability of housing practitioners to successfully advance sustainable development in their field

through their choice of housing construction materials and methods. Ability is therefore a more critical factor than values for housing practitioners in the advancement of sustainable development. The factors that arise from the study that are related to the issue of ability are discussed below.

Firstly, it has been shown from the findings of this study that factors that enhance housing practitioners' professional ability are the factors that most strongly influence their choice decisions for change. Melchert (2007) also highlighted the importance of economic interest to housing practitioners. This finding is important because it reveals that professional development and the ability to offer enhanced professional services are the factors that are most likely to result in the introduction of sustainable development innovation by housing practitioners.

Secondly, this study has shown housing practitioners treating the embodied impacts of different issues in different ways. This is an indication of an area that requires ability development. For a given housing technology to be understood to be appropriate in terms of its impacts on the local economy or the global environment, all of its embodied impacts need to be objectively assessed. The conclusion from this finding is that a clear and objective assessment process must be established that measures all the impacts of housing construction materials and methods on the economy and the environment. This will improve the ability of housing practitioners to ensure, through logical and systematic sustainable development performance evaluation, that they are meeting the requirements of sustainable development and choosing from among only those housing construction technologies that do not reduce people's ability to attain a good quality of life.

Finally, this study has presented empirical evidence to show that choice itself may be acutely hampered by a number of other factors. In the specific context of the study area, some of the factors that were found to hamper choice included inadequate resources, lack of exposure, lack of research in housing construction materials and methods and, most crucially, the lack of suitable options. The factors that were given as hampering choice of housing construction materials and methods here are examples that may be specific to the context of the study area, and the factors that hamper choice would vary in form and intensity, or even be absent, in other contexts. This does not alter the finding, which is that other factors can actively interfere with the choice processes of housing practitioners. The ability of housing

practitioners to make the right choices can thus be improved through learning and information dissemination.

Thus the findings show that ability at the housing practitioners' stakeholder level is a function of professional development, ensuring that the housing practitioners are equipped to recognise appropriate and inappropriate technologies and providing minimum standards to inform choice. However, none of these solutions can solve the problem of lack of suitable options. Innovation is again required at this stakeholder level to develop housing construction materials and methods that promote economic development, support environmental sustainability and at the same time satisfy the performance requirements of housing practitioners. In this way, the problem of lack of suitable options will be addressed. The next step for advancing sustainable development is therefore the specification of the ability relative value for innovation to satisfy the need for housing materials and methods that fulfil housing practitioners' requirements as well as sustainable development values.

7.7 Chapter Summation

Questionnaire data and group discussion data from architects in the study area were analysed in order to provide a better conceptual understanding of the choice mechanisms of housing practitioners and the role and importance of sustainable development to choice of housing construction materials and methods among this stakeholder group. Based on the quantitative and qualitative analysis of this data, a number of findings were revealed that led to the following conclusions:

- i. Housing practitioners' choice operates through rational performance evaluation processes. The housing practitioners' values focus their evaluation on performance areas that are related to the needs of the housing and the housing users. Sustainable development issues are not included in their choice criteria.
- ii. Housing practitioners have direct agency for sustainable development and the specification of the agent relative value for action on sustainable development should reflect this.

- iii. Housing practitioners expect that sustainable development issues would always be treated before they apply their own choice evaluation decision processes for specific uses. In this way, they only choose housing construction materials and methods from a feasible set of options that advance sustainable development. This mandatory pre-treatment of sustainable development issues was used to produce a propositional model that defines the relationship between housing practitioners' choice mechanisms and sustainable development change requirements.
- iv. Ability as it relates to sustainable development at the housing practitioner stakeholder level is related to professional development as well as to ensuring that appropriate options are available through innovation and identified properly.

The analysis of the data thus explains housing practitioners' choice behaviour at a theoretical level and the relationship that their choice requirements have with sustainable development. Both of these are original contributions to knowledge in the field of housing production. In addition, the analysis of the empirical data provides a basis to specify the agent relative and the ability relative values for advancing sustainable development, supporting the same conclusion from the housing users' choice behaviour analysis.

Chapter 8

Advancing Sustainable Development

8.1 Introduction to the chapter

The empirical case study research conducted with housing users and housing practitioners in Uyo, Nigeria provided information that directly answered the two main research questions:

- I. What are the choice mechanisms of various stakeholders that determine choice decisions of housing construction materials and methods?
- II. What is the relationship between these choice mechanisms and sustainable development?

Priemus (2005) makes a case for understanding all aspects of decision making as being necessary for the advancement of sustainable development in the field of housing production. The present behavioural study into the inherent choice behaviour of housing users and housing practitioners for choice of housing construction materials and methods has provided new understandings of their choice decision making behaviour and the relationship between the values that determine their choices and sustainable development values. This chapter aims to discuss the implications of this knowledge for the effort to advance sustainable development in the field of housing construction.

Housing construction has been shown to have major impacts on the economy and the environment because of the significant quantities of human and natural capital it uses. The findings from this study can serve to help ensure that these impacts are positive, for the sake of protecting and promoting the welfare of all people. As Welford (1997) has pointed out, the critical approach to research involves not only reporting the findings of the study, but also applying these findings to normative efforts aimed at improving the human condition. Sustainable development aims to protect the welfare of all people. In this chapter, the findings of this study are therefore applied to advancing the goals of sustainable development in three ways.

The first part of the chapter explores the outcome of combining the revealed housing users' choice mechanisms and housing practitioners' choice mechanisms with sustainable development requirements. The second part of this chapter provides the required specification of value statements for action to advance sustainable development in the field of housing construction. The third part of the chapter discusses choice engineering strategies to improve stakeholders' choice behaviour that are based on the choice mechanisms that have been evidenced in the empirical research. In this way, the study will show how improved understandings of stakeholders' choice behaviour play a crucial role in advancing sustainable development in the field of housing production.

8.2 Working Together For Sustainable Development

If achieving sustainable development in the field of housing construction is an important part of the effort to advance human welfare, then it is important to understand how all of the stakeholders in housing construction could act in concert towards achieving the stated objectives of developing the local economy and sustaining the global environment. This research study has set out the relationship between sustainable development and the different values on which the choice of housing construction materials and methods are based at each stakeholder level. The question here is: What is the relationship between sustainable development and the choice values of housing users together with the choice values of housing practitioners?

The findings from the fieldwork study with housing users showed that housing users are ready to choose housing construction materials and methods that meet the requirements of sustainable development as long as they can confirm that their own preferences and requirements have been satisfied. The findings from the housing practitioners showed that housing practitioners are ready to make their choices from among only those housing construction materials and methods that meet sustainable development requirements and that they also give due consideration to users' preferences where necessary. Putting these findings together would result in an understanding of the relationship between sustainable

development and all of the stakeholders in the field of housing construction, and show the possibility of all stakeholders working together to advance sustainable development.

This research has established that sustainable development requirements, housing practitioners' requirements and housing users' requirements are all different. Sustainable development is an ethical concern that focuses on the impacts of the housing technology on the economy and the environment in order to protect human welfare; housing practitioners have professional performance concerns that focus on the needs of the building and the users; and housing users have personal preferences based on social considerations and their own good. The consequence of not meeting the requirements of sustainable development in housing technologies is continued contribution to the severe problems of poverty and environmental degradation, resulting in reduced human welfare. But even where sustainable development requirements are carefully considered the consequences of not satisfying the requirements of the various stakeholders is the rejection of these housing technologies through the stakeholders' choice mechanisms – with the exact same result. Therefore, understanding the relationship between sustainable development and the choice mechanisms of all the stakeholders has value for advancing sustainable development.

Graphically, this relationship would be as shown in figure 26 below.

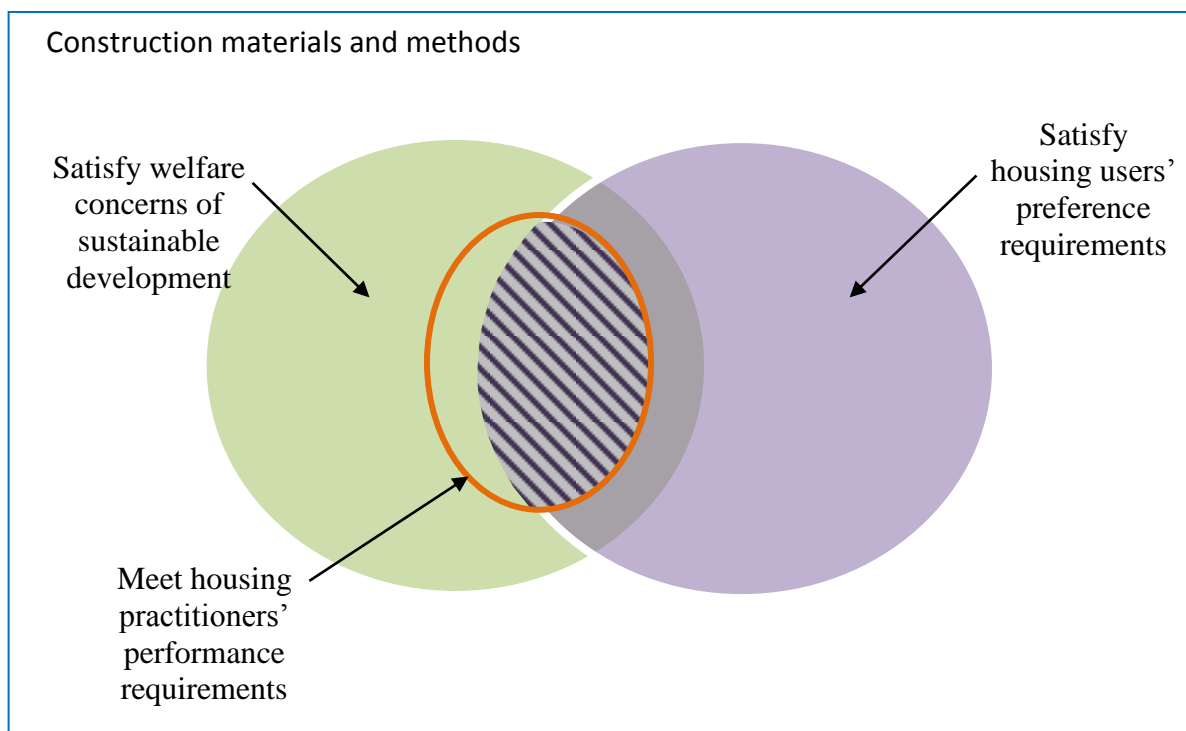


Figure 26: *Propositional model for choice and change in housing production*

In this model, the housing construction materials and methods that satisfy the preferences of housing users, meet the performance requirements of housing practitioners and help develop the economy and sustain the environment are those represented by the shaded portion in figure 26 above. This propositional model of the relationship between sustainable development and the choice mechanisms of stakeholders in the field of housing construction serves the crucial function of highlighting the conceptual region where the mechanisms of choice and the mechanisms of change converge. It focuses attention on the existence of the shaded area in the model, where the choice mechanisms of all the stakeholders' in the field function to advance sustainable development by inherently choosing change.

This is a crucial contribution of this research. The study shows how sustainable development goals can be advanced without any alterations to the inherent choice mechanisms of stakeholders in the field. This is the intuitively better course, which Melchert (2007) and others argue for. Value orientations are stable (Dietz and Stern, 2005). If the advancement of sustainable development relies on changes to the core values of stakeholders as Hay (2010), Jørgensen *et al.* (2009) and others hold, then the goals of sustainable development will be that much more difficult to attain. However, if indeed all stakeholders can work together to advance sustainable development without any basic alterations to the mechanisms by which they would naturally take decisions on choice of housing construction materials and methods, as this study concludes, the advancement of sustainable development in the field would be significantly easier.

This conclusion has implications for innovation. It means that innovation for sustainable development must be employed in identifying or developing housing construction materials and methods that meet all of the following requirements:

- Promote regional economic development;
- Support global environmental sustainability;
- Meet the professional performance requirements of housing practitioners; and
- Satisfy the preferences of housing users.

Therefore, discovering materials and methods that develop the economy or sustain the environment are necessary but not sufficient conditions to advance sustainable development in the field of housing construction. *All* of the above listed requirements need to be met. The survey of literature on sustainable development and housing construction showed that

innovation has been focused only on housing construction materials and methods that support environmental sustainability. This study holds that it is this focus, without due consideration for the other requirements, that has resulted in the poor uptake of innovative sustainable housing technologies. With the insight from this study on the nature of the relationship between sustainable development and the choice mechanisms of stakeholders, the advancement of sustainable development in the field of housing construction can be accelerated.

Furthermore, Seabright (1989), in discussing choice theory, called for studies that generate closer understanding between welfare theories concerned with choice outcomes and choice theories concerned with choice mechanisms. This description of the relationship between sustainable development and the choice mechanisms of the different stakeholders in the field qualifies as such a study. Therefore, this study feeds into the body of work on choice theory in addition to the body of work on sustainable development.

Several authors were discussed as having blamed stakeholders for the failure to advance sustainable development in the field (Jørgensen *et al.*, 2009 for instance). In some ways, they are right: the inherent choice mechanisms of stakeholders, as described here, would not result in the adoption of sustainable development innovations if they do not meet the requirements of housing users and housing practitioners or if they are perceived as doing them harm. However, this study has clearly shown that the advancement of sustainable development in the field of housing production does not require stakeholders in the field to adopt altruistic or ecocentric values. While this study agrees with the basic premise that stakeholder choice behaviour is working against the advancement of sustainable development in the field of housing production at this time, it does not accept their conclusion that stakeholders' choice behaviour therefore needs to change and evolve.

This study, in fact, supports the opposite conclusion: it is the technical aspects of action for sustainable development that should evolve, based on clear understanding of the choice behaviour of stakeholders. The advancement of sustainable development should not require deontic housing practitioners to do harm to housing users in order to pursue the goals of developing the economy or sustaining the environment; neither should sustainable development requirements override the preference requirements of housing users or the professional requirements of housing practitioners. Also, choice action for change should not

be portrayed as the duty of all stakeholders, but should clearly specify who is responsible in the field for choosing materials and methods that are good for the economy and the society.

This conclusion that it is the technical aspects of the sustainable development effort that need to evolve because of the social aspect of choice is interesting because it supports the idea of co-evolution between the technical and the social presented by Sach (1999), Jørgensen *et al.* (2009) and Paredis (2011). While their studies discussed how social behaviour does and should evolve as a result of the technical, this study focuses on how the technical components of steering, innovation and appraisal can and should evolve in response to our improved understandings of stakeholders' behaviour.

Thus, the findings of this study inform the evolution of adequately specified universal and relative normative value statements that guide steering, innovation and evaluation for sustainable development in the field of housing construction. The following discussion shows how these value statements can be specified in order to contribute to the advancement of sustainable development in the field of housing construction.

8.3 Specifying Normative Value Statements

8.3.1 *The Universal Sustainable Development Value*

The universal value provides for steering for sustainable development. Steering towards politically moral normative theories is usually the function of government agencies. Such steering is based on a universal value statement that all are required to honour. Based on the findings of this research, the deontologically proper universal value statement for sustainable development in housing construction was earlier specified as:

Housing construction should advance sustainable development without harm to the legitimate autonomous claims of housing users for their preferences and requirements.

This feeds directly into policy at all levels, regional, national and international, wherever sustainable development is aimed at. Professional bodies, organisations, pressure groups and other non-governmental agencies concerned with advancing sustainable development will

also find the deontological universal value statement essential for steering towards advancing sustainable development in the field of housing construction.

Value theory has shown that while a universal value can be honoured by all, it is not specific enough to provide for action in the field. This is the function of relative values, as was discussed in chapter 3 (McNaughton and Rawling, 1995b; Louise, 2004). The findings of the empirical study with housing users and housing practitioners identified the need to specify an ability-relative value and an agent-relative value that support action on the universal value to advance sustainable development in the field of housing construction.

8.3.2 Specifying the ability-relative value

The ability-relative value provides for action on innovation for sustainable development to support the universal value. Innovation has been shown to be one of the most important factors that enable mankind to carry out our activities in ways that do not impoverish others. The ability-relative value specifies the exact nature of innovation required from those who are able to innovate. The findings from this study on the choice mechanisms of stakeholders in the field of housing construction, and the relationship between stakeholders' choices and sustainable development requirements, inform the specification of the ability-relative value because it provided a clear description of what innovation is required to do in order for sustainable development to advance in the field of housing construction. Based on these findings, the ability-relative value for action on innovation to advance sustainable development is specified as:

Innovators of housing construction materials and methods should identify or develop housing construction technologies that help to develop the local economy, contribute to sustaining the global environment, meet the performance requirements of housing practitioners and at the same time satisfy the preferences of housing users.

Closing the gap between sustainable development requirements and the aspirations of stakeholders in this way will encourage stakeholders in the field of housing construction to choose change and use housing construction materials and methods that are good for the economy and the environment.

8.3.3 Specifying the agent-relative value

The agent-relative value provides for action on choice of housing construction materials and methods for sustainable development, to support the universal value. Choosing to use sustainable developmental housing construction materials and methods is another important action that affects the advancement of sustainable development in the field of housing construction. The agent-relative value specifies which of the stakeholder groups holds the duty or responsibility for this action.

The findings from both the housing users and housing practitioners led to the conclusion that housing practitioners rather than housing users have the duty and responsibility to sustainable development in the field of housing construction as a result of their agency as well as their inherent deontological value orientation. Even where meeting sustainable development requirements is not a legislative stipulation, housing practitioners have been shown in this study to have the necessary agency in the field as well as an appreciation of the consequences of using their agency to advance sustainable development; and where it is a legal stipulation, housing practitioners rather than housing users were shown to bear the responsibility of adhering to the law.

This informs the agent-relative value. Based on these findings, the agent-relative value for action on choice of housing construction materials and methods to advance sustainable development is specified as:

Housing practitioners should choose only those housing construction materials and methods that help to develop the local economy and contribute to sustaining the global environment.

Sustainable development will be advanced more effectively when the responsibility for sustainable development is not left open, or placed with end-users, but is specified to the practitioners in the field who have agency to actually use human and natural capital appropriately in their actions.

It is perhaps these specified values, and their far-reaching implications for sustainable development policy, innovation and action that best protect the findings of this study from the ‘duh’ principle (Graff and Birkenstein, 2006). Although it might perhaps seem obvious to state that housing users are seeking their own good and housing practitioners are seeking the good of the building and its users, this study argues that although these findings are

intuitively easy to accept as being correct, they are not obvious; if they had been obvious then the technical aspects of action for sustainable development would have evolved to reflect them long before now, and sustainable development would therefore have advanced much further.

The observed choice behaviour of stakeholders in the field shows them to be choosing housing construction materials and methods that do not advance sustainable development. Indeed, this study has shown that many authors have advanced various reasons for this observed choice behaviour. The explanations given for the observed failure of housing users and housing practitioners to choose housing construction materials and methods that are good for the economy and the environment, from the findings of this study, are

- the perfectionist nature of sustainable development policy;
- the lack of understanding of stakeholders' choice values and processes or the refusal to accept these choice mechanisms even when they were identified; and
- the failure to specify appropriate responsibility for choice action.

Therefore, incorporating the protection of the users' requirements into the universal sustainable development value statement and specifying the agent-relative and ability-relative value statements for action in the field are important contributions to knowledge for advancing sustainable development in the field of housing production.

One more important device for advancing sustainable development in the field of housing construction that is based on improved understandings of stakeholders' choice mechanisms is choice engineering. Choice engineering strategies that are adapted to housing users and choice engineering strategies that are adapted to housing practitioners are therefore discussed in the next section.

8.4 Choice Engineering for Sustainable Development

It has been established that currently, the greater majority of choice outcomes in the field of housing construction do not meet the requirements of sustainable development. Choice

engineering has been previously defined here as strategies for altering choice outcomes to obtain choices that are recognizably better (March, 1978).

Choice engineer may take either of two forms: operating within inherent value systems or operating through a change of values as was discussed in chapter 3. The available literature on choice and sustainable development was found to contain studies that seek to achieve change through choice engineer that requires change of values (Hay, 2010; Jørgensen *et al.*, 2009). This study explores the alternative of advancing sustainable development within the stakeholders' inherent values and choice processes. Studies in choice engineering have shown that an understanding of the choice mechanisms in operation for any given choice problem can be used to alter choice outcomes by using appropriate choice engineering strategies (March, 1978; Simon, 1955).

The choice mechanisms of the different stakeholders have been detailed from the findings of this study. From this understanding of choice mechanisms, choice engineering strategies are outlined here that advance sustainable development by employing stakeholders' inherent choice decision mechanisms in ways that cause them to change their choices to those housing construction technologies that advance the goals of sustainable development.

It must be pointed out here that where appropriate choices are not available, choice engineering will be quite ineffective. However, where the ability-relative value has been effective, and where suitable housing construction materials and methods that meet the requirements of the stakeholders and of sustainable development are available, choice engineering strategies can then be deployed by government agencies, professionals, social activists and others to increase the uptake of these suitable technologies. This study has established that for choice of housing construction technologies, the choice mechanisms of housing users are different from those of housing practitioners both in value orientations and choice processes. The choice engineering strategies for each stakeholder level will therefore be treated in turn.

8.4.1 Choice engineering strategies suitable for housing users

The values and processes by which this stakeholder group arrives at performance-based decisions on choice of housing construction materials and methods have been described in this study. Some of these new understandings of housing users' choice mechanisms provide

a basis for identifying suitable choice engineering strategies aimed at altering housing users' choice outcomes to make them work towards the advancement of sustainable development.

This empirical research shows that the housing users' decisions for choice of construction materials and methods are based on references that are external to the choice options themselves. This means that a choice of one housing technology over another is not equivalent to saying that the chosen technology is necessarily better than the other options. Only an understanding of the external references on which the decision was based explains the choice outcome. This is important to choice engineering because choices are altered, and even reversed, based on these external references, as was discussed by Sen (1977). This would not be a rational possibility if the choice decision was based on the performance of the technology itself (Bordes, 1976). An example from the study area will serve to illustrate this point. Durability was given as one of the external references that the housing users in the study area cited as determining their choice. This means that housing users would be willing to change their choice to an innovative material that they perceive to be sufficiently durable for their houses. Thus, the fact that housing users' choices are based on external references means that choice engineering would be effective at this stakeholder level when the external references on which their choice decisions are based are taken into consideration.

Status quo bias is a choice decision process identified among housing users in this study that is also relevant to choice engineering. This study found that housing users apply status quo bias in their choice decisions. The importance of this finding here is that housing users' choice outcomes would only be altered through choice engineering when the alternative choice is seen to compare favourably with the current choice in important respects.

Imitation is another choice process found among housing users that has relevance for choice engineering. Housing users were shown to base their choices on what others were using, particularly at the international level. The widespread interest in sustainable development and its impact on housing construction in other parts of the world can therefore be used to influence choice change to materials and methods that advance sustainable development. This will require publicising instances of successful changes to housing construction technologies based on sustainable development influences in other places. The inherent process of imitation will result in housing users making similar choices.

The process of melioration was another choice process found among housing users that is important to choice engineering for sustainable development. Melioration, the process by

which positive feedback from a given choice reduces over time, eventually leading to choice change. Where melioration is observed, it can be harnessed to advance sustainable development. This is best achieved by understanding and responding to the disadvantages that are the source of melioration, and highlighting comparative benefits in appropriate alternatives. For example, the present study showed that the preferred house type in the study area has become very expensive to build, and housing users are therefore open to cheaper alternatives. Where sustainable developmental alternatives are shown to be cheaper to build, melioration will cause a change in choice to these alternatives because of this cost benefit.

Epistemic value of the menu was another choice process found to operate for choice of housing construction materials and methods among housing users. This is also an important process for choice engineering because it shows the value that knowledge about new alternatives has for altering choice outcomes at this stakeholder level. Choice engineering strategies should thus include enlightenment programmes that point out the benefits of innovations in the field of housing construction.

Perhaps the most important choice process for choice engineering at the housing user stakeholder level is the u, v procedure. The u, v procedure describes the process by which sustainable development issues, v , only become choice determinants after the users' preference requirements, u , have been satisfied. The significance of the u, v procedure for choice engineering for sustainable development is that the abilities of a choice option to help develop the economy and sustain the environment are only relevant to housing users as additional benefits. They are not the primary benefit that housing users seek. The prediction from the u, v procedure is that focusing on the value of a housing construction technology to economic development or environmental sustainability will not result in choice change. Choice engineering would therefore mean presenting sustainable development attributes as additional benefits *over and above* the preference concerns of housing users. Only then will choice change result from the housing users' own choice mechanisms. The housing users' egoistic value orientation defines what benefits will qualify as the primary benefits as compared to additional benefits. Housing users seek their own good; indeed anything less would constitute harm. As additional benefits, however, sustainable development attributes directly determine choice. For instance, if two options are both adequately durable and affordable, but one is shown to impact positively on the economy and the environment, while the other impacts negatively, the u, v model predicts that the option with the positive impacts will be the choice outcome of housing users.

Social determinacy was also found to be a very strong factor that influences housing users' choice decisions. What the society looks down on or considers bad is automatically excluded as a choice consideration; similarly, what the society considers to be good is desired by housing users. The influence of society can therefore be harnessed as a means of advancing sustainable development through choice change, by creating a strong negative connotation for housing construction materials and methods that are known to detract from human welfare.

In the choice theory literature, framing has been shown to be an important tool for choice engineering. Altering the framing of choice problems has been shown to create choice change, even where the choice problem itself did not change, as was demonstrated by Tversky and Kahneman (1981 and 1986). They show that perception and judgement affect choice, and therefore acts, contingencies and outcomes can be framed in ways that alter perception and judgement. However, they warn that deliberate framing is susceptible to unethical use. The ethical concern is addressed here in three ways:

1. Framing is being proposed here for a good cause, sustainable development, which aims to protect human welfare.
2. Framing here is based not on deceit, but on frank open choice engineering strategies.
3. Framing here does not depend on changes to people's basic values or processes nor does it involve harm.

Guy and Shove (2000) hold that the framing of problems and solutions is often more important in determining whether innovation will be adopted by stakeholders than any technical barriers. For choice of housing construction materials and methods, housing users have been shown to be inherently egoistic: Egoism was the value basis for all their preference-based decisions. Framing sustainable development as a wider welfare concern, as Stern *et al.* (1999), Hay (2010) and others suggest, appeals to altruistic values. This study finds that this stakeholder group does not apply an altruistic value orientation in their choice decisions for housing construction technologies. Similarly, framing sustainable development as a means of avoiding harm to the welfare of others appeals to deontological values which were also not evidenced in the empirical study of the choice behaviour of housing users. Indeed Dietz and Stern (1995) write:

In general, we view ... social movements as generating social change by appealing to individuals' belief and value systems to frame public issues ...
(Dietz and Stern, 1995:272)

Rather than framing sustainable development in the field of housing production as protecting the welfare of others, it can be framed as protecting one's own welfare *as well*. In the same vein, unsuitable options should be framed as being detrimental to one's own good just as much as it is detrimental to others. By this, sustainable development would be perceived as a direct concern to the user. Egoistic values are thus brought to bear on the sustainable development decisions just as strongly as they are on the preference-based decisions.

In this regard, the difference between sustainable development and sustainability again becomes key, even at this practical level. Egoism can be activated in a normative policy that protects the interest of all; it has no part to play in a normative policy that protects only the interest of people in a segment of the society to which one can never belong – future generations. Similarly, egoism cannot be activated in a normative policy that places the good in the environment/ecology. Appealing to ecocentric or altruistic homocentric values has little impact on housing users' egoistic value system. Framing sustainable development as good for the housing user is given here as an effective way to advance sustainable development in the field of housing construction at the housing user stakeholder level because it appeals to the housing users' inherent egoism.

Finally, the understanding that housing users manage their choices strategically is of crucial importance to choice engineering at this stakeholder level. Stakeholders' choice mechanisms are not automated or instinctive but are products of thought and consideration under the control of the decision maker, thereby making them ambiguous. It would therefore be useful if sustainable development requirements could tap into this ambiguous, managed attribute of housing users choice behaviour and thereby advance even faster, for the good of all.

8.4.2 Choice engineering strategies suitable for housing practitioners

Housing practitioners have been shown in this study to base their choice decisions on performance evaluation of the housing construction materials and methods themselves. This study found that they have a deontological value orientation and they are most influenced by

issues that will improve their professional ability to provide housing. Choice engineering for housing practitioners will therefore work within these values and influences.

The first strategy for choice engineering at this stakeholder level will be to enable housing practitioners to evaluate the sustainable development performance of housing construction materials and methods. This differs from sustainable development assessment tools currently in wide use in a number of fundamental ways.

1. This study has shown that the impacts on the economy and on the environment need to be evidenced. As has been discussed in chapter 2, most of the existing assessment tools do not reveal economic impacts. This means that existing knowledge is not informing and guiding practical action as Clark and Dawson (1999) show it would when adequate decision support tools are used.
2. This study has also shown that evaluation occurs in two stages. The first stage is objective and does not differ with the context. Most current assessment tools are context specific and do not use the two stage evaluation process.
3. This study has shown that housing practitioners expect the sustainable development evaluation to serve in a mandatory, first-order proscriptive role. Even where current assessment tools are mandatory, such as in the United Kingdom, they do not serve the role of proscribing the use of housing construction materials and methods that have negative impacts on human welfare. This is the difference between formative and summative evaluation tools (Scriven, 1996; Rossi *et al.*, 2004). Summative evaluation tools are designed to enable decisions to be taken on whether the evaluation entity is acceptable or not. Formative evaluation tools do not serve this function. Other building codes are summative.

To advance sustainable development therefore, choice engineering for housing practitioners will require the development of a clear and unambiguous summative sustainable development evaluation tool that holistically assesses all the economic and environmental impacts of housing technology options and clearly specifies context-based standards that determine whether a given option is suitable for use or not. Such a tool will enable housing practitioners extend their inherent evaluation processes to sustainable development issues. This recommendation supports the call made by Sahota and Jeffrey (2005) for improvements in the current decision support tools to make them more usable. The provision of this evaluation tool is a technical process.

The second strategy proposed here relates to the inherent deontological value orientation of housing practitioners. Choice engineering here would involve providing legislation establishing specific, context-based standards for permitted levels of impact that housing construction materials and methods are allowed to have on the economy and the environment. Anything beyond these levels is defined as constituting harm in that context. In this way, the sustainable development choices are framed as avoiding harm and the inherent deontological values of housing practitioners will be activated in the cause of advancing sustainable development. This is the form of framing for other building regulations in common use such as fire safety regulations. Providing the relevant legislation is a political process.

The third choice engineering strategy to advance sustainable development recommended for housing practitioners is related to improving their professional ability, thereby improving the services they are able to provide. Where training and practice has resulted in knowledge and experience in the use of a limited range of materials and construction methods, the housing practitioner is not able to use other technologies. Training courses and research programmes will therefore be effective means of expanding housing practitioners' professional ability in this regard. This strategy reflects the conclusion reached in Williams and Dair (2007) on the need for professional training in appropriate materials. As housing practitioners become more proficient with alternative materials, they will be able to use them for housing construction, thereby advancing sustainable development in the field. Providing the necessary training is an education function.

8.5 Chapter Conclusion

As a critical step in this research, the findings and conclusions from the empirical study have been applied to advancing sustainable development in the field of housing construction. By combining the relationships found between sustainable development and the choice mechanisms of the various stakeholders in the field, it was shown that there is a possibility of all parties working together to advance sustainable development. This is likely to occur as long as the preference requirements of housing users and the performance requirements of housing practitioners are met in a given housing construction technology, in addition to the

welfare requirements of sustainable development for developing the local economy and sustaining the global environment.

This informed the need for innovation in housing construction that meets all of these requirements. The ability-relative value for action on innovation in the field of housing construction was specified to reflect this need. The agent-relative value for action on choice was also specified, naming housing practitioners rather than housing users as the agents to ensure that housing construction materials and methods that advance sustainable development are chosen. The ability-relative value and the agent-relative value provide for action to support the specified deontological sustainable development value statement, which protects the autonomous rights of housing users.

Finally, choice engineering strategies to advance sustainable development in the field of housing construction were discussed. Choice engineering is concerned with improving choice outcomes, in this case to increase the uptake of housing construction materials and methods that support economic development and environmental sustainability. Choice mechanisms of housing users and housing practitioners that were identified from the empirical research provided the basis for recommending choice engineering strategies, using the stakeholders' inherent values and choice processes. For housing users, the choice engineering strategies recommended were:

- Understanding and responding to the external references on which their choice decisions are based.
- Providing benefits relative to the status quo.
- Publicising sustainable development-based choices in other places.
- Responding to sources of melioration by providing superior benefits that result in change of choice.
- Presenting sustainable development features as additional benefits over and above the benefits to the user.
- Using framing as a tool to define the welfare component of housing construction as also being good for the housing user.
- Developing an understanding of ambiguity in housing users' choice behaviour as a means of ensuring that they manage their choice decisions in ways that advance sustainable development.

For housing practitioners, the following choice engineering strategies to advance sustainable development were recommended:

- A clear evaluation process for objectively assessing and contextually judging all the economic and environmental impacts of housing construction materials and methods, in keeping with housing practitioners' inherent evaluation processes.
- Legislative standards for sustainable development impacts that prohibit harm, in keeping with housing practitioners' inherent deontological values.
- Training and research to improve housing practitioners' competence with alternative materials and methods, in keeping with housing practitioners' inherent interest in improving their professional ability.

It was also pointed out that choice engineering is only useful where appropriate choices are available.

The findings of this research on the choice mechanisms of stakeholders for housing construction materials and methods with specific relation to sustainable development have led to the prediction that if the requirements of the different stakeholders are met, if appropriate action is understood and undertaken and if proper choice change strategies are applied, sustainable development in the field of housing construction will advance.

Chapter 9

Conclusion: Choosing Change

9.1 The Research Problem

Sustainable development is a call for change in order to ensure that our activities promote economic development and support environmental sustainability (WCED, 1987). In the field of housing production, this provides a theoretical and normative basis for changing the construction materials and methods we use for housing construction based on welfare values. Sustainable development steered by government agencies employs policies and legal instruments aimed at making sustainable development values and processes relevant in the field of housing construction. The change processes that sustainable development steered employs are technological innovation and impact assessment tools.

Studies have shown that housing users and housing practitioners are not changing to appropriate housing technologies to an appreciable degree; most people are still choosing housing construction materials and methods that do not advance the goals of sustainable development.

This indicated the need for a better understanding of how and why housing users and housing practitioners arrive at choice decisions on the construction materials and methods they use. This research was therefore aimed at construing the choice mechanisms of stakeholders in the field of housing production and the relationship between these choice mechanisms and the change requirements of sustainable development. The study employed the theoretical concepts from choice theory, evaluation theory and value theory to analyse and discuss the choice mechanisms that emerged from empirical fieldwork. The fieldwork was conducted in Uyo, Nigeria as an instrumental case for understanding the inherent mechanisms of choice of stakeholders in the field of housing production. Group discussion interviews and questionnaire interviews were used to collect the data from the selected research participants at the housing user and housing practitioner stakeholder levels.

9.2 The Empirical Research

The research questions that the research sought to answer were:

- I. What are the inherent choice mechanisms of stakeholders in the field of housing construction that determine their choice of housing construction materials and methods?
- II. What is the nature of the relationship between these stakeholders' choice mechanisms and sustainable development requirements for housing construction materials and methods?

This PhD thesis was a behavioural study in the field of housing production. The research was conducted under the critical realist epistemology and ontology. Critical realism not only accepts underlying mechanisms as knowledge, but it also holds that it is these underlying mechanisms that provide theoretical explanations of observed outcomes. Crucially, an understanding of underlying mechanisms also enables the prediction of outcomes.

Knowledge of the underlying choice mechanisms that determine stakeholders' choice of housing construction materials and methods is critical to the advancement of sustainable development in the field of housing production because it enables the prediction of the ways that stakeholders' choice behaviour can be harnessed for the sustainable development effort in the field of housing construction. Koebel (1999) and Bossink (2007) highlight the importance of understanding stakeholders' behaviour in order to advance sustainable development.

Thus, it was the underlying choice mechanisms of the housing users and the housing practitioners that the empirical research aimed to identify. The study also aimed to define the nature of the relationship between the change requirements of sustainable development and the choice requirements of the stakeholders. The empirical research employed a qualitative instrumental case study design carried out in Uyo, Nigeria. The fieldwork was conducted at the housing user stakeholder level and the housing practitioner stakeholder level. This produced rich data on the choice attributes of the research participants in the case study area. The emphasis was on ensuring that the research participants express themselves in their own way, to ensure veracity of the findings.

9.2.1 Housing Users

Group discussion interviews with members of three organisations in the study area selected from a range of employment status categories provided the data on

- The research participants' choice considerations for decisions on housing construction technology options;
- The place of sustainable development in their choice;
- Who they felt had the primary duty to act on sustainable development in the field; and
- Whether they would support new legislation on sustainable development in the field of housing production.

This data was analysed using qualitative data analysis techniques. The findings from the data analysis provided information on the values, influences and choice process that determine choice of housing construction materials and methods at the housing user stakeholder level as well as the ways in which these housing users' choice determinants were related to sustainable development.

9.2.2 Housing Practitioners

Self-completion questionnaire interviews, containing both closed and open-ended questions were administered to architects in the study area. These completed questionnaires provided the data on

- The level of importance that the respondents accorded to sustainable development issues;
- Who the respondents thought had the primary duty to act on sustainable development issues and why;
- The factors that would influence them to use innovative housing technologies; and
- Whether they believed sustainable development issues should be mandatory or voluntary and why.

This data was analysed using both qualitative techniques and descriptive statistics. The findings from the data analysis provided information on the values, influences and choice

processes that determine how and why choice decisions are reached among housing practitioners as well as the ways in which these housing practitioners' choice determinants were related to sustainable development.

9.3 Review of the Findings

9.3.1 *Housing users' choice behaviour explained*

Based on the findings from the study, a theory of the choice mechanisms of housing users was formulated. This contributes to the gap in conceptual knowledge of stakeholder choice behaviour, as identified by Crabtree and Hes (2009). Societal requirements, such as for prestige and being in fashion, were shown to create the first-order determinacy of the materials and methods housing users consider acceptable for housing construction. Individual preferences then define the criteria on which their choice decisions are based. These preferences all reference choice criteria that are external to the choice options themselves, such as durability and modernity. This means that a choice of *a* over *b* is not the same as saying that *a* is better than *b*; *b* could still be rationally chosen over *a* where the external references on which the choice was based require the change. Sen (1973) discussed the concept of external references, and crucially, demonstrated its relevance for choice change.

Cost, in particular, was given as playing an important role in the choice process. Housing users preferred to keep costs down. This supports the findings by Crabtree and Hes (2009), Scarpa and Willis (2010) and Rid and Profeta (2011) all of whom report that the high cost of sustainable innovations is a major barrier to their uptake by housing users.

The empirical research findings showed that housing users' choice decisions are based on multiple rationales among which sustainable development concerns did not feature. Sustainable development is a concern for the good of all, but all of the rationales on which the housing users' choice decisions are based are for their own good. This finding goes a long way to explaining the finding by Williams and Dair (2007) that there was almost no demand from housing users for sustainable construction technologies. Housing users' choice considerations, requirements and preferences all show that they consider their own benefits to

be of primary importance. Thus the study concludes that for choice of housing construction materials and methods, housing users employ an egoistic value orientation. The housing users were shown to uphold their requirements and preferences as autonomous rights, which they are prepared to defend.

In addition to the egoistic values that tell us why housing users make the choices they do, the study also developed theoretical knowledge of how they choose housing construction materials and methods. A number of choice processes were identified from the data in this study at the housing user stakeholder level. These are:

- Status quo bias, where the perceived benefits of current choices have to be exceeded before a change in choice will occur.
- Imitation, where the decision is based on what other people are using for housing construction.
- Melioration, where the positive feedback from a current choice diminishes over time resulting in desire for change.
- Dynamic aspiration levels, where the expectations of the housing user are lowered or raised in order to produce either possible choices or unique choices, respectively.
- Epistemic value of the menu, where knowledge from new choices that become available results in choice change.
- Ambiguity of preferences, where housing users manage their preferences strategically.
- The u, v procedure, where moral considerations only become the choice function where their egoistic considerations are seen to be satisfied.

Together, these choice mechanisms explain how and why housing users arrive at choice decisions for housing construction options. At this conceptual level, this knowledge provides a theoretically and empirically grounded basis for predicting choice outcomes. Crucially, this knowledge is useful for exploring ways to advance sustainable development in the field of housing production.

9.3.2 *Housing practitioners' choice behaviour explained*

The study confirmed that housing practitioners arrive at rational choice decisions based on the two-stage evaluation process of assessment of the attributes of a given construction technology and judgement of the worth of these attributes for the specific housing project. This means that, unlike with the housing users, their choices are referenced directly to the choice options themselves. For housing practitioners, a choice of *a* over *b* can be translated to mean that *a* is better than *b* for that context; *b* cannot be rationally considered to be better than *a* for that same use.

Another basic difference between the choice behaviour of housing practitioners and housing users is their value orientation. While it was seen that the choice of housing construction materials and methods among housing users is a function of an egoistic value orientation, housing practitioners were shown to make this choice based on a deontological value orientation – they seek to avoid harm in the conduct of their duties. Avoiding harm to housing users was found to be an important issue for housing practitioners.

Basic similarities between the choice mechanisms of housing practitioners and the choice mechanisms of housing users were also observed. For housing practitioners as with housing users, choice decision criteria do not include sustainable development concerns. More traditional professional concerns, such as structure and function, comprise the performance criteria on which their performance evaluation is based. Indeed, the main factor influencing choice and choice change among the housing practitioners was found to be the improvement of their professional ability.

9.3.3 *Stakeholders' choice mechanisms and sustainable development*

This study took as a starting point, the assumption that the inherent choice behaviour of the different stakeholders in the field of housing construction is independent of, and prior to, the more recent sustainable development requirements imposed by the need to protect the environment and develop the economy. The study therefore aimed to identify these inherent mechanisms and then establish their relationship to sustainable development. In this way, the study provides the kind of 'knowledge spanning' between technical, impact-based understandings and social, intention-based understandings of sustainable development issues that Courtney (2001) and Moore and Rydin (2008) promote. However, this was not carried

out from a neutral ideological position. This research study was conducted with the recognition that there is an urgent need for housing users and housing practitioners to change their choice outcomes and use housing construction technologies that advance sustainable development.

This study makes a crucial contribution to knowledge for advancing sustainable development by showing that stakeholders' inherent choice itself can become a mechanism of change in the field of housing production. The contributions of this study therefore go beyond theoretical understandings of the choice behaviour of housing users and housing practitioners. It also provides practical recommendations and strategies aimed at advancing sustainable development, which are based on the fuller understanding that this study has developed of these stakeholders' choice behaviour.

The nature of the relationship between housing users' choice requirements and sustainable development values for choice of housing construction materials and methods was modelled from the findings of the study with the housing users. Housing users were shown to accept no direct responsibility for sustainable development action in this field. Their primary duty is to themselves. It was therefore inductively concluded from the study that housing users operate an egoistic consequentialist value system for their choice of housing construction materials and methods; the good they seek is their own. If an option does not meet their preference requirements, they will reject it as a choice, irrespective of its value to the greater welfare.

However, it was also found from the study that housing users would seek the welfare of others where they are confident that their own good has been secured. This choice phenomenon where welfare concerns (v) only become choice determinants where self-interests (u) have all been seen to be satisfied is identified as the u, v procedure. This study concluded that the u, v procedure describes the relationship between housing users' values and sustainable development values.

The nature of the relationship between the requirements of housing practitioners and sustainable development values for decisions on housing construction materials and methods was also developed from the findings of the study with the housing practitioners. Housing practitioners were found to accord high levels of importance to economic development issues and environmental sustainability issues in housing production. Based on the high level of importance housing practitioners accorded to sustainable development issues, their

deontological value orientation which seeks to avoid harm in the conduct of their activities and their election of the mandatory treatment of sustainable development issues, the relationship between housing practitioners' choice mechanisms and sustainable development was defined as a first-order proscription of housing technologies that do not satisfy the welfare requirements of sustainable development. Their professional performance evaluation would then be used to choose from among a feasible choice set defined as those housing technologies that can be shown to meet sustainable development standards.

Taken together, these relationships were used to generate a single propositional model representing the relationship between the different stakeholders' choice mechanisms and sustainable development requirements. This propositional model is a critical contribution to knowledge in the effort to advance sustainable development in the field of housing construction because it highlights the circumstances under which stakeholders' inherent choice behaviour would cause them to choose change.

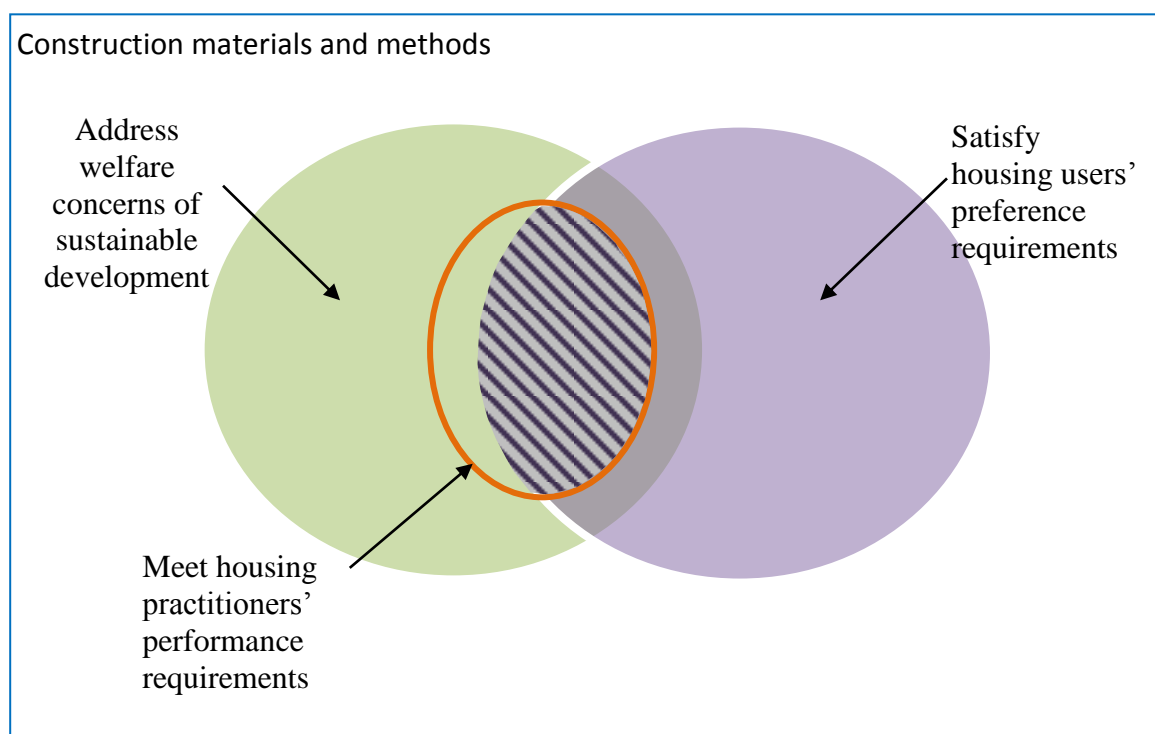


Figure 27: *The propositional model for 'Choosing Change'*

This model made it possible to predict the circumstances under which inherent stakeholder behaviour would advance sustainable development efforts in the field of housing construction. This study submits, based on its findings, that the only housing construction

materials and methods which the inherent choice mechanisms of housing users and housing practitioners will choose that advance sustainable development is represented by the shaded area in the model, where the materials and methods used for housing construction satisfy all of the following requirements:

- They promote regional economic development;
- They support global environmental sustainability;
- They satisfy the preference requirements of housing users; and
- They meet the professional performance requirements of housing practitioners.

This model supports the calls made by Lorenz *et al.* (2005) and Kaatz *et al.* (2005) to integrate the requirements of other stakeholders in the decision making process. In fact, this study concludes that it is the failure to meet all of these requirements that has hampered sustainable development efforts in the field of housing construction.

The ‘supply push’ assumption, which holds that identifying and producing technologies that are good for the environment is adequate to result in choice change, is erroneous as Koebel (1999), Martens, (2006), Williams and Dair (2007), Jørgensen *et al.*, 2009 and many others have pointed out. Alternative models for advancing sustainable development have also been shown to be inadequate in engendering the needed change, either because they do not show a good understanding of inherent values (such as Menzel and Wiek, 2009 and Schultz, 2001); or the roles of preference and agency are not adequately appreciated (as seen in Stern *et al.*, 1999; Stern, 2000); or because they require stakeholders to change their inherent and stable values (for example, Brown and Vergragt, 2008, Jørgensen *et al.*, 2009 and Hay, 2010).

More positively, this study submits that sustainable development in the field of housing production is more likely to advance quite rapidly if housing technologies that meet all of these requirements given above can be used. This is because inherent stakeholder choice values and processes will work for, rather than against, the attainment of the goals of sustainable development by causing choice change to choice outcomes that promote economic development and support environmental sustainability.

9.4 Sustainable Development Value Statements

Another crucial contribution of the study is the specification of sustainable development value statements which are based on the social understandings of choice behaviour. Adequately specifying value statements creates a sustainable development value structure that provides for protection from harm in sustainable development steerage, incorporates stakeholders' requirements in innovation activities and provides a basis for action in choosing appropriate technologies. These are all technical components of the sustainable development effort. This is in keeping with Courtney (2001), who explains that it is important to combine technical and social perspectives in the pursuit of sustainable development. Similarly, Moore and Rydin (2008) call for knowledge spanners between technical and behavioural approaches to advancing sustainable development.

9.4.1 Incorporating protection into sustainable development steerage

The findings from this study have shown that housing users have autonomous requirements that do not work against sustainable development. The housing users were seen in this study to be willing to defend their autonomous rights to satisfy their preferences; indeed the study holds that their legitimate autonomous rights should be protected. This informed the specification of the universal sustainable development value statement to include a deontological clause for protecting the autonomous rights of the housing users to seek to achieve their own preference requirements. Thus, based on the findings of the study, the neutral sustainable development value statement in the field of housing construction was written as:

Housing construction should advance sustainable development without harm to the legitimate autonomous claims of housing users for their preferences and requirements.

This specification avoids perfectionism and the resistance it causes (Kymlicka, 1989; Rawls 2005; Sen 2003). In this form, the sustainable development value statement can serve as a non-perfectionist, politically moral value to be universally honoured. This is a fundamental shift in steerage for sustainable development. Governments and other organisations that wish to develop sustainable development policy are better informed by the findings of this study and should specify the protection clause in their sustainable development policy statements.

This clause was missing from the outset, in the Brundtland Report (WCED, 1987), and has not been seen to guide sustainable development efforts in the field of housing production, particularly in the important area of cost. This study recommends that this protection clause be immediately incorporated and honoured in sustainable development policy in the field.

9.4.2 *Incorporating stakeholders' requirements into sustainable development innovation*

The findings from the study also have important implications for innovation. It means that employing innovation in the service of discovering housing construction technologies that are good for the environment is necessary but not sufficient to advance sustainable development in the field. Even expanding the remit of innovation to include technologies that develop the economy will not be enough to advance mankind towards the goals of sustainable development. In recognition of the urgency of advancing sustainable development through housing production, the task of simultaneously satisfying sustainable development requirements, housing practitioners' professional requirements and housing users' preference requirements is one that needs to be addressed immediately through innovation.

This study therefore recommends that the function of innovation for sustainable development be expanded so that innovation simultaneously addresses stakeholders' choice requirements. This will bring benefit to the stakeholders as well as to the economy and the environment. This recommendation led to the specification of the ability-relative value statement for technological innovation in sustainable development to include all the requirements of the stakeholders in the field. Hence:

Innovators of housing construction materials and methods should identify or develop housing construction technologies that help to develop the local economy, contribute to sustaining the global environment, meet the performance requirements of housing practitioners and at the same time satisfy the preferences of housing users.

This value specification helps to avoid conflicts between the requirements of sustainable development and the requirements of the other stakeholders, which have been shown to hamper the advancement of sustainable development (Crabtree and Hes, 2009; Scarpa and Willis, 2010; Rid and Profeta, 2011).

9.4.3 Providing a reason to act to choose change

Evidence from the literature showed that more stakeholders urgently need to start choosing to use sustainable developmental housing construction materials and methods. The findings of this study show that neither the housing users nor the housing practitioners think that housing users have any agency in this regard. The findings from the data analysis show that housing practitioners believe that by their agency, they have the responsibility to choose only appropriate materials and methods. Furthermore, housing practitioners were found to consider both economic impacts and environmental impacts important.

Housing users were shown to accord priority to their own requirements and preferences. The findings from the empirical research also show that housing users operate an egoistic value orientation that is not directly synonymous with the welfare concerns of sustainable development. However, housing practitioners have a deontological value orientation that puts them in position to act to prevent harm to the welfare of others. Based on these findings, the study therefore concludes that it is the housing practitioners that have the duty to act in this regard. This conclusion directly informs the specification of the agent-relative value statement for action on choice. Hence:

Housing practitioners should choose only those housing construction materials and methods that help to develop the local economy and contribute to sustaining the global environment.

This places responsibility for choice action to support sustainable development firmly with the housing practitioners, as Salè (1999) had suggested. It would also reduce the buck-passing identified in Crabtree and Hes (2009) as one of the factors hampering sustainable development in the field.

Placing the responsibility with housing practitioners requires that they have adequate tools and know-how to recognise appropriate options. This, in turn, has direct implications for the assessment of the sustainable development impacts of housing construction materials and methods. A number of shortcomings have already been identified in the existing assessment tools in common use. For housing practitioners to choose from among only appropriate housing technologies, they need to be able to apply a summative evaluation choice process based on explicit sustainable development performance criteria. For housing practitioners to choose from only those technologies that are acceptable, they need to have a baseline standard. The study therefore recommends the urgent technical development of an evaluation

methodology by which housing practitioners can first objectively assess sustainable development impacts and then proscribe unsuitable housing technologies based on context-relevant standards for unacceptable impacts, established by legislative process.

Thus, in addition to choice itself, innovation, assessment and steerage have all been progressed as a result of the findings of this study. In fact, it can be seen from this study that the changes needed to advance sustainable development are not in stakeholders' choice values or processes, but rather in the manner in which the various aspects of the technical components of the sustainable development effort in the field of housing construction have been pursued. This study therefore concludes that

- i. Steerage needs to include the protection of users' autonomous rights from harm;
- ii. Innovation needs to be expanded to meet the requirements of stakeholders in the field; and
- iii. Assessment needs to be upgraded to two-stage summative evaluation with clear and objective impact measurement procedures and mandatory judgement standards.

This means, in effect, that the technical aspects of the sustainable development effort in housing production are being shaped by the social aspects. This conclusion supports the assertion made by Sach (1999), Jørgensen *et al.* (2009) and Paredis (2011) that the technical and the social aspects of innovation adoption co-shape each other.

9.5 Improving choice decisions

Finally, the study made recommendations for choice engineering strategies at each stakeholder level, based on their inherent choice processes. The choice engineering strategies developed here can only be applied in situations where appropriate housing construction technologies have been developed and identified. It is then possible to apply choice engineering strategies aimed at improving choice decisions.

Rid and Profeta (2011) find that there is still unrealised demand for housing that meets sustainable development requirements. Martens (2006) and Williams and Dair (2007) advocate energising the demand for these technologies. Koebel (1999) cites low user demand

as one of the factors hampering the adoption of appropriate technologies. Choice engineering helps ensure that stakeholders in the field alter their choice outcomes so that they are choosing to use housing construction materials and methods that satisfactorily address the welfare concerns of sustainable development, thereby increasing demand for appropriate housing construction technologies. These choice engineering strategies can be employed by government agencies or other interest groups.

The choice engineering strategies presented in this study all operate within the inherent choice mechanisms of stakeholders that have been identified through the empirical research. March (1987), Dietz and Stern (2005) and Melchert (2007) all explain that the level of success achieved in choice engineering is directly proportional to the extent to which the choice model reflects actual behaviour. Values are stable (Brown and Vergagt, 2008; Dietz and Stern, 2005) and Melchert (2007) warns against strategies that require changes to the stakeholders' inherent values or choice process.

Choice engineering for housing users

Choice engineering strategies for housing users are based on their inherent egoistic value orientation, the importance they give to social influence and their inherent choice processes that have the ability to lead to choice change. The choice engineering strategies recommended in this study as a means of improving the choice outcomes of housing users are:

1. Ensuring that the external correspondences on which housing users' choice decisions are based are understood and taken into consideration. For instance, if keeping cost down is an important point of reference, introducing a cheaper option will meet with success while introducing a more expensive innovation will meet with rejection and resistance because of this reference point.
2. Ensuring that the choice option offered compares favourably with the status quo in aspects that the housing user considers important.
3. Publicising sustainable developmental success stories from other parts of the world in order to activate the housing users' inherent imitation process.
4. Responding to disadvantages in the existing choice in order to employ melioration to the advantage of the new option.

5. Enlightening the housing users on the benefits that the innovation has for them. The choice process described as epistemic value of the menu will make the knowledge gained cause the desired choice change. Rid and Profeta (2011) refer to housing users' low level of awareness of the issues as one of the factors currently hampering the adoption of appropriate technology. Providing adequate information on the benefits of the alternative construction technologies will thus result in choice change.
6. Treating sustainable development benefits as additional to the housing users requirements rather than as the primary, and even the only, benefits of the housing technology. The housing users' inherent u, v choice procedure will then cause them to select the sustainable developmental options that are seen to also satisfy housing users' requirements.
7. Creating strong negative connotations for unsuitable options at the societal level. Social determinacy will therefore serve to make the housing users reject these unsuitable options.
8. Framing sustainable development as protecting the housing user's own welfare and at the same time framing unsuitable technologies as detrimental to the housing user's own wellbeing. The inherent egoistic value orientation of the housing users will therefore help to make them choose the sustainable developmental option.

Finally, it was observed that the strategic management of ambiguous preferences by housing users also remains a powerful tool in choosing change. Housing users are unlike objects in the natural world in as far as they participate in the creation and management of their choice processes. Recognising and respecting this attribute is therefore an important part of any strategy to alter choice behaviour.

Choice engineering for housing practitioners

Choice engineering for housing practitioners is based on their inherent evaluation choice processes, their deontological value orientation and the importance they accord to professional development. The choice engineering strategies recommended as a means of improving the choice outcomes of housing practitioners were:

1. Developing a summative evaluation method for housing construction materials and methods to evidence both their economic and environmental impacts in order to enable housing practitioners identify and thus proscribe unsuitable technologies.
2. Establishing legal standards of harmful economic and environmental impacts in order to enable housing practitioners ascertain that they avoid harm. This reflects the reports of Crabtree and Hes (2009) and William and Dair (2007) in which calls are made for proper regulations and official sustainable development standards by the professionals in their studies.
3. Providing professional training in the use of alternative housing construction technologies as an opportunity for professional development. This matches the suggestions made by Williams and Dair (2007) in this regard.

The findings from this empirical research have led to the conclusion that the inherent choice mechanisms of stakeholders in the field of housing construction are not synonymous with sustainable development but they are also not inimical to its advancement. Rather, stakeholders' choice behaviour can be harnessed to advance sustainable development through the application of suitable sustainable development policy, innovation and impact evaluation and through the implementation of choice engineering strategies appropriate to the stakeholder level. Thus the research can be seen to have taken a critical approach to the findings and conclusions of the study. It goes beyond reporting the identified choice mechanisms and their relationship to sustainable development; it also makes recommendations for action in order to improve the human condition.

9.6 Original Contributions to Knowledge

This doctoral dissertation has made a number of important and original contributions to knowledge in its theoretical framing, its methodological approach to knowledge production as well as its findings from the research and consequent recommendations.

Conceptually, the multidisciplinary theoretical framework within a critical realist philosophy combined decision theories in the social sciences and technical building science knowledge

with the normative theory of sustainable development. This is an original theoretical framing that has important implications for the future of multidisciplinary research.

At the methodological level, the study recognises and engages with the ‘local professional’. This is also a novel approach to knowledge production in housing research in developing areas. Most research in these areas typically produces knowledge either through the local layman or the outside expert. The local expert has been recognised, such as in the Kenyan study by Rukwaro (2009). Fahmi and Sutton (2008), for instance, introduce quotes from a local architect and two local town planners into their Egyptian study. However, the majority of research in the field of housing in the developing world focuses local knowledge production on laymen. Knowledge production on choice behaviour in this research was local and endogenous at the level of both the lay person and the expert in the field.

The findings from this empirical research produce new knowledge that fills a gap in our theoretical understandings of the underlying mechanisms that determine choice of housing construction materials and methods at the different stakeholder levels. In the field of housing production sustainable development provides values and processes for change to the technologies that we use for housing construction, while stakeholders provide values and process that determine their choice behaviour. The contributions of this doctoral dissertation to knowledge, for understanding the choice behaviour of stakeholders in this field when faced with housing construction materials and methods options, are:

- I. This study has construed many of the underlying inherent values and processes of choice that are characteristic to each stakeholder level, housing users and housing practitioners. This provides improved conceptual understandings of choice behaviour at each of these stakeholder levels. A major output of this exploratory research has been a nascent theory of housing users’ and housing practitioners’ choice behaviour for choosing housing construction materials and methods.
- II. This study has modelled the relationship between the requirements that originate from housing users’ and housing practitioners’ choice mechanisms and the requirements that originate from sustainable development mechanisms for change.
- III. This study has provided recommendations and strategies at policy level and at each stakeholder level to advance sustainable development in the field of housing production. These recommendations and strategies are based on the conceptual

understandings that the empirical research provided of stakeholders' choice behaviour and its relationship to sustainable development.

9.7 Limitations of the Study

At the methodological level, the findings of this research were drawn from data within a specific instrumental case of study. The research participants were chosen using purposive sampling. While this study has highlighted the advantages of using purposive sampling in a specific case study as a means of studying inherent choice behaviour in-depth, it is also important to acknowledge that this methodological approach is also the main limitation of the study. Replication of the study with other populations would therefore provide a more complete understanding of the choice mechanisms that determine housing construction materials and methods choices among housing users and housing practitioners. Furthermore, the findings and conclusions that have emerged from the study need to be tested on larger samples before they can be widely adopted.

Also, one of the characteristics of the study area chosen for this study was that it was a developing area. This was expected to imbue a higher level of importance to economic issues in relation to environmental issues, an assumption that did not hold up empirically. However, the research is not able to provide information on the veracity of the equivalent existing claim that environmental issues take precedent in developing areas. The findings of this study indicate that this claim needs to be examined empirically. It would therefore be of value to investigate choice behaviour in an area where the converse could be reasonably assumed – that is where environmental issues could be assumed to take precedence – to see if that assumption would stand or fall on empirical investigation.

9.8 Suggestions for Further Research

This research has been an exploratory study into choice behaviour. A number of findings have emerged from the study. The study does not claim comprehensiveness, only veracity and generalizability. Further studies into choice behaviour will, no doubt, reveal other values, influences and processes that determine how choice decision are reached in the field of housing production and refine, confirm or refute the ones presented here. Nevertheless, this study provides an empirically and theoretically grounded started point for further studies aimed at explaining choice behaviour as well as those aimed at advancing sustainable development.

As an exploratory study, this research is a multidisciplinary study that sits at the forefront of the intersection of decision theory and sustainable development theory in the field of housing production. At the practical level a number of suggestions and recommendations have emerged from the empirical study of choice behaviour among stakeholders in the field. Sustainable development is crucial for human welfare and this study predicts how the housing industry can turn around and become a powerful force for good through proper choices of housing construction materials and methods and suitable choice engineering strategies. It is important to monitor the effects of implementing these recommendations, not only to see the extent of impact on sustainable development, but also to discover any shortfalls or challenges that may arise out of these recommendations that may not be apparent from this study. If indeed the recommendations made here are found to have a significant impact on the adoption of technologies that advance mankind towards sustainable development goals, then they need to be quickly adopted widely because of the urgency of advancing sustainable development to secure the welfare of people today and tomorrow.

At the theoretical level, the research abstracted a number of generalised law-like statements on the choice behaviour of stakeholders in the field of housing production. As with all nascent theory, these behavioural theories need to be subjected to rigorous testing to see if they hold true in all contexts, to identify which contexts they hold true in and to understand the effect that given contexts have on their applicability. The theories of stakeholder choice behaviour suggested here could then be universally adopted, modified, modified in certain contexts or rejected as subsequent research indicates.

At the conceptual level, the study responds to the need to adequately interrogate the social aspects of innovation adoption as suggested by Koebel (1999) and other studies reviewed in this thesis. It does this by investigating the phenomenon of choice behaviour. Other social phenomena that have been reported in the literature to influence sustainable development include:

- 1 Organisational theory and cooperation (Moore and Rydin, 2008; Bossink, 2007; WCED, 1987 among others)
- 2 Power and powerlessness (Paredis, 2011; Stern *et al.*, 1999; WCED, 1987 among others)
- 3 Politics and political processes (Swyngedouw, 2010; Beerepoot, 2005; Pett, 2004; WCED, 1987 among others)

These and other theoretical areas also need to be investigated through multidisciplinary research in the field of housing production in order to understand how they relate to the more technical aspects of the sustainable development effort.

Temporally, this study focuses on the housing production stage of the lifecycle of a house. As Louise (2004) shows, agency is bound to temporal context. Behavioural studies are suggested in the other lifecycle stages of housing, in order to identify the stakeholders whose agency is crucial to the advancement of sustainable development at those stages, and to understand their behaviour attributes and how their behaviour affects sustainable development in the field. Further studies are therefore needed on the choice behaviour of stakeholders at the subsequent stages of housing – the building in use and the decommissioning stages. The stakeholders who have agency for sustainable development at these housing stages should also be identified and the relationship between their behaviour and sustainable development effort should be established in order to help ensure that housing does not contribute to poverty and environmental degradation at any stage during its life-cycle.

Finally, the study repeatedly identifies the shortcomings of the dominant sustainability discourse and the ways in which it is hampering the sustainable development effort. The empirical findings also indicate a number of problems with focusing on sustainability. It is therefore necessary to investigate the source and strength of this sustainability discourse with a view to replacing it with the more useful sustainable development concept in order to

achieve the laudable, and urgent, goals of economic development and environmental sustainability that safeguard the welfare of all.

As a last note, the researcher would like to comment on the effect that this research process has had on her own thinking. This research was not undertaken from a neutral value stance. As an active sustainable development advocate, I approached this study with the aim of contributing to the advancement of sustainable development. At the time, I had the conviction that the welfare requirements of sustainable development were important enough to be the primary consideration in all choices. The research process has humbled me. I now understand that responsibility for advancing sustainable development in the field of housing production is not the responsibility of all stakeholders. I also understand that housing users as well as housing practitioners have requirements that need not be overridden in the name of wider social welfare. This new understanding has altered my thinking in fundamental ways.

9.8 Final Summation

This study has advanced our knowledge of how and why stakeholders in the field of housing construction arrive at decisions on choice of materials and methods to use for housing construction. Housing users' inherent choice behaviour arises from an egoistic value orientation which focuses on preferences and requirements for their own good. Housing practitioners' inherent choice behaviour arises from a deontological value orientation and focuses on performance evaluation of the housing technology for the good of the building and the building users. The study has also finds that while these various choice mechanisms are not synonymous with the welfare concerns of sustainable development, they are not opposed to it either. Based on this understanding of stakeholders' choice mechanisms, the study predicts the circumstances under which the choice behaviour of stakeholders in the field of housing construction would work together to advance sustainable development. This is where housing technologies are used that satisfy the preference requirements of housing users, meet the professional performance requirements of housing practitioners and at the same time address the welfare requirements of sustainable development for economic development and environmental sustainability. This prediction was presented as the most crucial contribution this research makes to knowledge, and it informed the specification of:

- The harm protection neutral value statement for sustainable development policy to be universally honoured by all;
- The ability-relative value statement for action on innovation for sustainable development to encompass the requirements of the housing user and the housing practitioner; and
- The agent-relative value statement for action on choice for sustainable development to specify the housing practitioner as the stakeholder responsible for choosing only housing construction technologies that have acceptable sustainable development impacts.

Thus, the study concludes that stakeholder choice behaviour requires that we make fundamental changes to the manner in which sustainable development steering, innovation and impact assessment are currently being undertaken. This has implications for both policy and practice. Based on the findings of the research, the study also recommends a number of strategies by which the inherent choice processes and values of housing users and housing practitioners can be harnessed so that they spontaneously choose to change to housing construction materials and methods that promote local economic development and support global environmental sustainability. Finally, the study suggests areas where further research would contribute to deeper understanding of stakeholder behaviour in the field of housing aimed at the advancement of sustainable development, for the betterment of all.

Appendix A

Field Instruments

INTERVIEW SCHEDULE FOR GROUP DISCUSSION INTERVIEWS WITH HOUSING USERS

Good day. I would like to start by thanking all of you for helping me with my research. I am a student of architecture at Newcastle University, and I am carrying out a study on the materials and methods we use to build our houses. I will use your answers for my school work, and I will not identify any of you in my work.

I have a list of questions here which I will ask you, and then I would like you to discuss these questions. I will record your answers on my electronic recorder.

Q1 A middle-aged couple, Mr X and his wife Mrs X, both in their mid-forties, have worked hard all their lives and are now in a position to build their own home. Another couple, Mr and Mrs Y, both in their late twenties, are just starting out in life, but they have been able to secure a mortgage loan and so they are also ready to build their own house.

What are the things that Mr and Mrs X and Mr and Mrs Y will have to consider when they are choosing the materials and methods to use?

KEY WORDS: Main considerations

Q2 Their architects introduce them to a new construction system that uses natural, local materials and local labour.. He wants them to use these innovative materials and methods to build their house because they help the local economy to improve and provides jobs for people in their locality. He also tells them that these new technologies are good for the environment; they do not pollute the ground or the air and they use less energy, so our children's children will not suffer later for the actions we are taking now.

When Mr and Mrs X and Mr and Mrs Y are making their decisions, how important would these types of considerations be to them?

KEY WORDS: Place of sustainable development issues

Q3 Who should have the primary duty of ensuring that all the materials and methods we choose for building our houses are good for our economy and good for the environment? Should it be the home owner or the professionals or the government?

KEY WORDS: Whose duty?

Q4 Would you or would you not support the idea of introducing new laws that make people prove that their housing construction is good for the economy and the environment, and why?

KEY WORDS: Support for new legislation

Thank you once again for responding to my request. Your contribution is valuable to my work and I sincerely appreciate the time you have put in here today.

QUESTIONNAIRE FOR ARCHITECTS (Members, NIA AKS Chapter)

Good day Colleagues,

For my PhD, I am conducting research in which I investigate the importance of the relationship between housing construction options in South-Eastern Nigeria and sustainable development. I need your help to inform me on choice of housing construction materials and methods.

Please assist me by completing the following questionnaire:

SECTION 1: RATING SUSTAINABLE DEVELOPMENT ISSUES

Based on your professional judgement, please rate each of the following sustainable development issues by level of importance in the context of the *current* socio-economic and environmental situation in Akwa Ibom State. Place a tick in the space that represents **the level of importance you** accord to each issue.

1.1 In order to contribute to **developing the local economy**, housing construction should:

	Not relevant in this place and time	Slightly relevant	Important	Very important	Crucial in this place and time
DEVELOPMENT ISSUES					
a.) Use money efficiently in the production of living space.					
b.) Retain money in the local economy.					
c.) Use labour efficiently in the production of living space.					
d.) Provide jobs.					

1.2 In order to contribute to **sustaining the global environment**, housing construction should:

	Not relevant in this place and time	Slightly relevant	Important	Very important	Crucial in this place and time
SUSTAINABILITY ISSUES					
a.) Minimize waste of materials.					
b.) Avoid polluting the environment.					
c.) Use energy efficiently in the production of living space.					
d.) Minimize CO ₂ emissions during the production processes.					

SECTION 2: RESPONSIBILITY

- 2.1 Who do you think should have the **primary duty** to ensure that housing construction promotes the greater good by contributing to the local economy and the global environment? Please tick one
- The clients
- Building professionals
- Government agencies

2.2 Please, describe briefly **what such duty** would entail.

2.3 In the course of your professional duties, which of the following factors has or would influence you to specify a **new or unfamiliar** building material or method for a housing project? Please tick one box for each factor.

	Strong influence	Weak influence	No influence
Competitive or profitable advantage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clients' request or interest	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government incentives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adequate training in its use or properties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your own interest in experimenting and learning new skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A lot of people are starting to use it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obligations to the wider community (outside your primary obligations to the building users)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.4 In choosing between housing construction methods and materials, should the consideration of sustainable development issues be **voluntary or mandatory**, and why?

2.5 Please describe briefly any examples of the ways that you have had to consider any of the development and/or sustainability issues listed in Section 1 in the **past** in the course of your professional career, stating what issues arose, how or why they arose and what decisions or actions were taken.

SECTION 3: PERSONAL INFORMATION

3.1 What year did you complete your architectural training? _____

3.2 Do you practice mainly in (please tick one)

Professional practice	<input type="checkbox"/>
Client representation	<input type="checkbox"/>
Public administration	<input type="checkbox"/>
Education	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

3.3 Your gender is Male Female

Thank you very much for your contribution.
Eno Nyong
Newcastle University
May, 2011.

INTERVIEW SCHEDULE FOR GROUP DISCUSSION INTERVIEWS WITH HOUSING PRACTITIONERS

Good day and thank you very much for helping me today.

As some of you may already know, I am undertaking a research degree at Newcastle University. Some of you have already helped me in this work by filling in my questionnaires. I have prepared some topics here that I would like you to discuss, and I will record your discussion and use it for my research. This should not take too long.

What I will do is say a topic, and you will take it from there and discuss what it means to you in relation to your choice of housing construction materials and methods.

TOPIC 1: Capital flight

TOPIC 2: Energy efficiency

TOPIC 3: Waste of materials

TOPIC 4: The factors that would make you choose a new or unfamiliar housing construction technology.

Thank you once again for responding to my request. Your contribution is valuable to my work and I sincerely appreciate the time you have put in here today.

Appendix B

Thematic Analysis of Group Discussion Data: HOUSING USERS

The four themes for the thematic analysis were developed from the empirical research questions. These themes are

- 1 The main considerations on which choice of housing materials and methods is based.
- 2 The place of sustainable development issues in the choice of housing construction materials and methods.
- 3 Whose duty it is to ensure that housing construction does not contribute to poverty and environmental degradation.
- 4 Support for new sustainable development legislation.

The thematic analysis uses Framework, a tool developed at the National Centre for Social Science Research in the United Kingdom. Framework is used to manage and summarise the group discussion interview data into the four given themes. The data from the Framework analysis on these four themes is presented for each of the three discussion groups in tables 15-17 below.

	MAIN CONSIDERATIONS	PLACE OF SUSDEV ISSUES	WHOSE DUTY	SUPPORT FOR LEGISLATION
Group 1: Civil Service Assoc.	<ol style="list-style-type: none"> 1. Cost (primary) 2. People lower quality to make bldg more affordable. 3. Durability 4. Modernity 5. In fashion 6. Location 7. Time / speed of constructn 8. Aesthetic beauty 9. Prestige 10. Structural strength 11. Individual taste 12. Stand the test of time 13. People want the best 14. Take pride in one's decision 15. People just follow the crowd 	<ol style="list-style-type: none"> 1. People too selfish 2. Builders don't put in their best 3. Level of professionalism not high – more interested in money 4. Depends on exposure and orientation 5. People want to satisfy their own individual choice 	<ol style="list-style-type: none"> 1. Government - provide facilities 	<ol style="list-style-type: none"> 1. Yes 2. People only do as much as they have to 3. Policy currently inadequate

Table 15: *Framework analysis of the civil servants' discussion data*

	MAIN CONSIDERATIONS	PLACE OF SUSDEV ISSUES	WHOSE DUTY	SUPPORT FOR LEGISLATION
Group 2: Market Traders	<ol style="list-style-type: none"> 1. Land + clearing the land 2. Materials 3. Durability 4. People pass comments / belittle you 5. Low maintenance 6. Same type of houses seen outside 7. Cost is first consideration 8. Style, beauty 	<ol style="list-style-type: none"> 1. Local building materials will be cheaper 2. No problem of supply 3. Why should I mind to help my neighbour 4. If it can give me what I want I will consider it 5. Some rich people can consider such things 6. Poor people worrying about how to help themselves 	<ol style="list-style-type: none"> 1. Home owner 2. Good if govt could come in 3. Using his own money so should be good for him 	<ol style="list-style-type: none"> 1. No 2. We may not have range of products 3. Not need a law to enforce what is good for people 4. Already too many costly requirements pushing up cost of construction – new requirements will make it more difficult to build

Table 16: *Framework analysis of the market traders' discussion data*

	MAIN CONSIDERATIONS	PLACE OF SUSDEV ISSUES	WHOSE DUTY	SUPPORT FOR LEGISLATION
Group 3: Chamber of Commerce	<ol style="list-style-type: none"> 1. How to find money to build 2. Durability 3. Pride among peers 4. Permanent structure 5. Cultural preference / cultural value 6. Meet up with society's expectations 7. No awareness of diversification of materials and methods 8. Price or cost 9. Availability 10. Construction time in re inflation 11. Low maintenance 12. Structural strength 13. Modern amenities can be installed 	<ol style="list-style-type: none"> 1. Local input is needed 2. People more interested in profiteering 3. Govt houses unaffordable 4. Lack of awareness of susdev issues 5. Show it is adequate, people will embrace it faster 6. Elites may be concerned - most people interested in advantages and disadvantages to themselves 7. If people are valuing the wrong things, no one will be interested 8. Climate change now a serious issue 9. Not try new things, especially with housing - do what everyone else is doing 	<ol style="list-style-type: none"> 1. Govt not actively interested in welfare 2. Govt machinery turns slowly 3. Duty of govt - campaign, demonstrate, support 4. Professionals can key into advantages - individual home owners can benefit 5. Professionals come up with new materials + demonstrate their advantage 6. Govt encourage and utilize them for projects 7. If people see it and start using it it becomes popular 	<ol style="list-style-type: none"> 1. Yes 2. Advantages for govt and for people 3. Press should illuminate and enlighten on the process of formation of laws 4 Building codes regulate construction 5. New building codes - people will comply

Table 17: Framework analysis of the business owners' discussion data

Appendix C

Coding Frame for Questionnaire Data:

HOUSING PRACTITIONERS

The coding frame was based on a clear and explicit set of rules. In these ways, the reliability and validity of the data were strengthened (Silvey, 1975; Bryman, 2008). The rules of the coding frame used for the classification of the questionnaire data are outlined in detail below.

Q1.1 and 1.2: Level of Importance of Sustainable Development Issues

From the literature review in chapter 2, the eight different sustainable development issues, four in each of the two domains of economic development and environmental sustainability that provide valid causal links between sustainable development theory and housing construction materials and methods were identified. Lazarsfeld *et al.* (1977) explain that the measure of a concept is linked to the measure of the different components of that concept as determined by theory. Question 1 sought to elicit the level of importance each respondent accords to sustainable development. Therefore, these eight issues formed the eight components of the question. ‘Should’ statements describing each issue were used to form a summative judgement scale (Likert, 1932), a 5-point Likert scale (Likert, 1974), describing five levels of importance. Each of the five levels of importance was coded from 1 to 5, with 1 being the lowest level of importance and 5 the highest. 3 represents the neutral position; neither high nor low importance.

This data was further coded in two stages.

Stage 1 – Coding the importance of individual issues: The initial coding was re-coded to indicate the importance accorded each issue using reduced categories, as shown in table 18 below. Reducing the number of categories in this way serves to reduce central tendency error (Bardo *et al.*, 1982).

Code	Level	Source code
1	Not important – Importance levels below the neutral position	1 and2
2	Important – Neutral position of importance	3
3	Very important – Importance levels above the neutral position	4 and5

Table 18: *Coding 'Importance of sustainable development issues'*

This coding produces ordinal level data for use in comparative statistics.

Stage 2 – Coding the importance of domains: The initial data was also re-coded to indicate the importance accorded each domain by taking the sum of all the original codes for the four component issues in that domain:

Variable	Code	Source code
Economic domain	Possible range from 4 to 20	Σ Q1.1
Environmental domain	Possible range from 4 to 20	Σ Q1.2

Table 19: *Coding 'Importance of domains'*

This produces a form of interval level data generated from the multiple indicators within each domain (Bryman and Cramer, 2004). This interval level data was then computed to show whether the summative value of all issues in the economic domain is equal to, higher than, or lower than the summative value of all issues in the environmental domain. This produced nominal level data, describing how many respondent considered each domain to be more important.

Q2.1: Primary duty

The coding for this question was based on categories of responsibility derived from evaluation theory and sustainable development theory in housing construction. This is nominal level data useful for descriptive statistics. Responses of ‘clients’ were coded 1; ‘professionals’, 2; and ‘government agencies’, 3. However, it should be noted here that one respondent chose all three categories. For the purposes of coding, this response was given a unique code, 4, as ‘other’.

Q2.2: What the duty entails

This was an open-ended question designed to understand the kind of duties that were expected and to further investigate the domains that were considered important by the respondents. The data was coded in three stages.

Stage 1 – Categorising the form of duty: All of the responses were categorised at a level of abstraction that was based on similarities in the form the duty was to take. A two digit code system was used: the first digit reflects the duty category from Q2.1; the second digit represents the form of the duty as derived from the responses. The codes for this question are detailed in table 20 below.

Code	Form of duty
Professionals	
21	Professional initiative
22	Government control
Government agencies	
31	Legislation and monitoring
32	Government support to professionals
33	Government research
Multiple responses	
41	Includes legislation
42	Does not include legislation

Table 20: *Coding 'Form of duty'*

Some respondents gave more than one duty, and the duties they gave fell into different categories. For the purpose of coding, they were placed in the 'Multiple responses' category. This produces nominal level data useful for descriptive statistics.

Stage 2 – Categorising the value orientations indicated by the responses: This data was re-coded to group the responses into categories derived from value theory. The two categories that determine how the proposed action could be considered to be of ethical value to the respondent are adherence to law or concern for consequence.

Code	Value orientation of the respondent	Source codes
1	Adherence to law	22, 31
2	Concern for consequence	11, 21, 32, 33, 40

Table 21: *Coding 'Value orientation'*

This produces nominal level data describing the value orientations of the respondents.

Q2.3: Influencing Factors

This is a closed-choice question that indicates how much each of seven factors would influence change in choice of housing construction materials and methods. The components are derived from the literature on innovation in housing construction as well as the data from the user group discussions. A three-point Likert scale is used here to describe the level of influence each of the components may exert on the respondent. These are coded 2 for strong influence; 1 for weak influence; and 0 for no influence for each factor. This produces ordinal level data.

These seven influences are then grouped under three new variables that reflect the source of the influence in relation to housing practitioners. The data was re-coded to reflect the sum of the influences comprising each category as shown in table 22 below. New codes were created to describe the overall level of influence of each group on the respondents. This also produces ordinal level data useful for comparing the influence from different sources.

Variable	Source code and influence	Coding
Improvements to professional ability	$\sum a,d,e$ a) Profitability d) Training e) New skills	0 = 0 No influence 1-3 = 1 Weak influence 4-6 = 2 Strong influence
Influences from outside immediate sphere of duty	$\sum f,g$ f) Other people using it g) Public good	0 = 0 No influence 1-2 = 1 Weak influence 3-4 = 2 Strong influence
Influences from within immediate sphere of duty	$\sum b,c$ b) Client c) Government	0 = 0 No influence 1-2 = 1 Weak influence 3-4 = 2 Strong influence

Table 22: Coding 'Overall level of influence'

Question 2.4: Voluntary or mandatory

This was expected to be a closed choice question. 'Voluntary' was coded 1 and 'mandatory' coded 2. However, two of the respondents responded by stating that the consideration of these sustainable development issues should be both mandatory and voluntary. These responses were therefore given a category of 'Both' which was coded 3. This produces nominal level data describing the selection made by the respondents.

In all cases, missing data was coded 0.

It should also be noted that the questions on personal information were not used in this data analysis because there were too few respondents in many of the categories for any meaningful statistical tests to be carried out. However, the data is useful for the future when the sample population can be expanded to include other housing practitioners in the study area.

Appendix D

Thematic Analysis of Group Discussion Data: HOUSING PRACTITIONERS

The four themes for the thematic analysis of the housing practitioners' group discussion were developed from the analysis of their questionnaire data. These four themes were discussed with respect to sustainable development values and the ways that these issues relate to choice of housing construction materials. The four issues discussed during this housing practitioner discussion interview are:

1. Capital flight (a local term that refers to failure to retain money spent in the local economy).
2. Waste of materials.
3. Energy efficiency.
4. Factors influencing the decision to change to innovative housing construction materials and methods.

Framework is used here again to manage and summarise the group discussion interview data into the four given themes. The data from the Framework analysis on these four themes is presented in table 23 below.

CAPITAL FLIGHT	WASTE OF MATERIALS	ENERGY EFFICIENCY	FACTORS INFLUENCING CHOICE
<ol style="list-style-type: none"> 1. Construction materials are imported. 2. Foreign contractors use expatriate staff, all their inputs are imported from their home country. 3. Expertise of local builders and whether they are used. 4. Some things you can't control, to be modern you have to go foreign. 5. Capital flight is bad for a developing economy. 6. The imbalance is bad for a developing economy. 	<ol style="list-style-type: none"> 1. Non-professionals in charge of building sites. 2. No materials estimation is done. 3. Also, sketchy specs and instructions may result in waste. 4. Waste of time. 5. Recoverable waste and non-recoverable waste. 6. Environmental issue of where to dispose of waste. 7. Environmental aspect is not the consideration, but cost to client. 8. Waste depends on project management capability and work method. 	<ol style="list-style-type: none"> 1. We don't really think much of energy efficiency during construction or even design. 2. Tropical environment doesn't cause us to think much about energy. 3. Need mechanical cooling. 4. No control of mechanical cooling. Energy conservation awareness and interest are not there. 5. Not much energy used on site, but during manufacturing it may be high, like cement. 6. Local industry uses less energy to produce the same building. 7. Energy is not a concern for the builder because of the disconnect between site workers and manufacturers. 8. In temperate regions, energy issues are different. 	<ol style="list-style-type: none"> 1. Availability is first and foremost. 2. Because choices are limited, we now focus on how to get it cheaper. 3. Even where new things come into the market, we are careful because of limited resources. 4. Someone who has the resources can afford to experiment with the new material or method. From there others learn, take it up. 5. Depends on type of design; available funds; the client and his preferences. 6. Location, for example by the ocean. 7. Available equipment and method. 8. Exposure – if you travel widely you may specify more and different materials and methods.

Table 23: *Framework analysis of the architects' group discussion data*

Appendix E

Letter of Appreciation to Research Participants

Date

Executive and Members

THE ORGANISATION,

Uyo.

Dear Sirs and Madams,

LETTER OF APPRECIATION

I am writing to thank you sincerely for participating in my research on choice of housing construction materials and methods.

By giving your time and thoughts freely, you have made it possible for me to undertake this study and make some contribution to knowledge. For this I am truly grateful.

This research is dedicated primarily to you and to the people you represented in your interviews. I have placed this study in the public realm as required, and the knowledge is now available to all who may wish to understand your point of view.

I know that I have no way to pay you for your contributions, but I have tried to faithfully record and analyse your words and meanings in good faith.

Thank you once again and may God bless you all.

Eno Nyong,
Newcastle University.

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