

# **Integrating Geo-information tools in Informal Settlement Upgrading Processes in Nairobi, Kenya**

A Thesis Submitted to Newcastle University for the Degree of

**Doctor of Philosophy**

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## **Abstract**

### **Integrating Geo-information tools in Informal Settlement Upgrading Processes in Nairobi, Kenya**

The continuing existence of informal settlements within the cities of developing countries presents a threat to development objectives. To address challenges existing within informal settlements, upgrading and planning approaches have integrated technology-based tools, such as Geographic Information Systems, to quantify, visualise and provide information that can support decision-making processes.

The integration of Geo-Information (GI) tools in upgrading processes is seen to provide the necessary information that city planners need to take action on informal settlements. However, there is as yet no appropriate framework for the integration of these tools within the upgrading processes. The primary focus in upgrading settlements is the improvement of living conditions through addressing existing environmental challenges, with the active participation of their respective communities. Planning processes have adopted inclusive approaches which are geared towards getting all actors, including communities, involved in decision-making and planning for interventions. GI tools offer a platform for better information, thereby enabling communities especially to participate effectively in the planning and management of new infrastructure, as well as settlement upgrading. This study therefore proposes a responsive and inclusive framework for the integration of GI tools in upgrading processes.

The study was carried out in three informal settlements within Nairobi City, Kenya. Using a range of qualitative methods, the study critically examines the participation by respective stakeholders, especially communities, and how the GI tools have been used to address existing challenges within the settlements. The discussion and analysis is divided into three themes: 1) the process 2) the participation 3) addressing the challenges. It shows that owing to the GI tools, enhanced participation and subsequent empowerment of communities at various levels of upgrading took place. However, certain barriers still exist. The intrinsic challenges that abound in social, cultural and political landscapes continue to hinder low-income communities from achieving high-level participation in upgrading.

**Key words:** Geo-information tools, upgrading, participation, informal settlements, environmental challenges

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To the communities I have been working with, I hope through this research and other forums, together we can create opportunities to address challenges facing the settlements and hopefully make a contribution towards improving living conditions. It is not easy but where there is a will there is a way.

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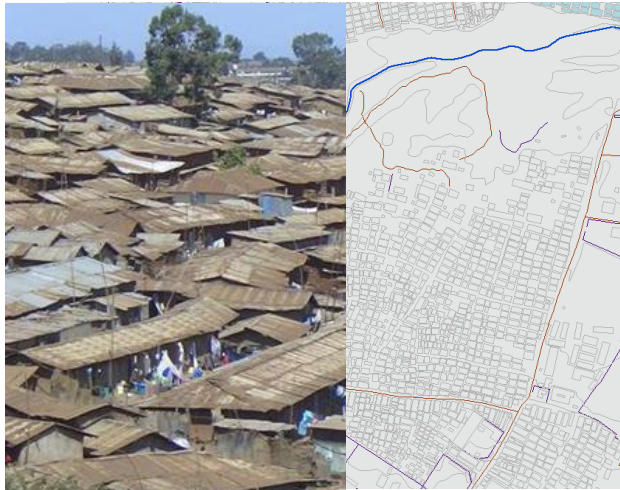
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## List of Abbreviations

<b>COHRE</b>	Centre on Housing Rights and Evictions
<b>DO</b>	District Officer
<b>GI</b>	Geographical information or Geo-Information
<b>GIS</b>	Geographic Information Systems
<b>GoK</b>	Government of Kenya
<b>GPS</b>	Geographical Positioning System
<b>HH</b>	Household
<b>IASC</b>	Inter Agency Steering Committee
<b>IMF</b>	International Monetary Fund
<b>KENSUP</b>	Kenya Slum Upgrading Programme
<b>KRA</b>	Korogocho Residents Association
<b>MDGs</b>	Millennium Development Goals
<b>MLS</b>	Ministry of Lands and Settlement
<b>MoLG</b>	Ministry of Local Government
<b>NEMA</b>	National Environmental Management Authority
<b>PGIS</b>	Participatory Geographic Information Systems
<b>PIU</b>	Programme Implementation Unit
<b>PPGIS</b>	Public Participation Geographic Information Systems
<b>PRSP</b>	Poverty Reduction Strategy Papers
<b>SAP</b>	Structural Adjustment Programme
<b>SIDA</b>	Swedish International Development Agency
<b>SPIU</b>	Settlement Programme Implementation Unit
<b>VGI</b>	Volunteered Geographic Information



# Chapter 1

Putting the Poor on the Map



## **Chapter 1: Putting the Poor on the Map**

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## 1.1 Putting the Poor on the Map

*“My first day out: mapping Kibera. Fully equipped with the necessary tools as an urban planner and Geo-Information expert, I set out to carry out my first informal settlement mapping activity. Mapping the mighty Kibera, the largest informal settlement in Kenya and home to more than 500,000 people, living in an area of approximately 50ha, felt like learning to swim from the deep end. Little did I know this was going to be the beginning of a journey leading to this research! I saw firsthand the environmental challenges facing the settlement, met, and worked with the community and settlement leaders and was moved. Using aerial photographs, the community helped our mapping team orient and identify structures and other features on the ground. I was amazed at the knowledge our helpers had regarding their settings. There were moments when I wondered who the planner was. The community had good knowledge of who owned the structures, where water points were located, which structures were affected by the flooding river and hot spots where illegal brewing and criminal activities were a common occurrence. I was apprehensive but the presence of the community leaders reassured me...*

*I was eager to contribute, albeit in a small way, to help the community improve its living conditions. My passion for the research on how to address challenges within informal settlements using Geo-Information was created...*

*Many days out: on several occasions the community invited me to settlement planning forums, where they sought my advice on the best way forward with the mapping and information generated. I could see the eagerness on their faces when I stood up to speak and give my “expert” opinion ... Over time I was engaged by other organisations in other urban areas, to support their mapping activities in settlements. The story was the same; I worked alongside the “real” planners and their leaders in mapping their settings. As I work towards improving approaches to integrating Geo-Information tools in upgrading processes, I take cognizance of the challenges ahead, but I nevertheless look forward to making a small contribution... Through this research, I seek to explore how GI tools can best be integrated in upgrading processes to realize some of the benefits outlined above and help communities to address the challenges facing them.*

## 1.2 Settlement Upgrading: The people, tools, processes and objectives

Although this study draws from both professional and personal experiences, there is considerable interest among academics and practitioners for exploring the integration of Geo-Information (GI) tools in settlement upgrading. In Asia, Joshi *et al.*, (2002), Patel (2004), Aksoylu (2005) and Hasan (2006), for example, have demonstrated how GI tools have been used by poor urban communities to help address challenges such as inadequate access to water and sanitation. In Latin America, Martinez (2009), Perez and Perez (2008), Turkstra *et al.*, {, 2003 #208} present cases on the usefulness of GI tools for human settlement planning and upgrading. In Africa, Huchzermeyer (2009b), Glockner *et al.* (2004), Sliuzas (2004) and Abbott (2004b), explore how GI tools have been integrated into settlement upgrading processes to address issues such as the lack of secure tenure and poor infrastructure. In the above cases, the role played by communities is significant. Communities have been involved in collecting data and proceeding to use the same to support decision-making processes aimed at improving their living conditions. This act is considered empowering to otherwise powerless communities. The urban poor and their settings have long been excluded, viewed as *unplannable*,<sup>1</sup> and not considered as part of city fabric (Roy, 2005; Rakodi, 2004).

Current policy epistemologies are characterized by emphasis on the moral capacity of the poor and excluded. Earlier works such as those of De Soto<sup>2</sup> initiated a paradigm shift, resulting in the formalization and recognition of informal settlements by national governments. This for example led to the “*incorporation of the informals into the bureaucracy*”,<sup>3</sup> where active participation by urban poor communities in decision-making was recognized. This has given rise to the paradigm of sustainable human development, which is driven by the idea of enablement and empowering the poor to help themselves. These are the guiding principles of many upgrading strategies, which take the opposite approach to previous policies that sought to eradicate informal settlements. This new movement and paradigm was used successfully in the favela-barrio programme of Brazil.

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<sup>1</sup> As used by Ananya Roy (2005:150) to describe the complex nature of informal settlements and the challenge they present to planners.

<sup>2</sup> De Soto, H. (1989) *The other path: The invisible revolution in the Third World*. London: I. B. Taurus.

<sup>3</sup> *Ibid.*: 117

In this case it was proved that providing services on site was much cheaper than relocating residents of informal settlements to new housing on the periphery. However, it is also important to note the limitations of urban upgrading (Roy, 2005). This approach has been applied in other developing contexts in Africa and Asia with mixed results. An analysis of the two main settlement upgrading approaches (comprehensive and incremental) unveils mixed outcomes.

The comprehensive approach seeks to identify all the important aspects related to the social, economic and physical landscape within the settlement, with the aim of proposing a redevelopment plan that addresses all of these. The main problem associated with this approach was the large financial human and human resource outlay required for this to work effectively. These resources are often lacking in developing country contexts, thereby making the approach less feasible. The method has however been successful in Latin America, where the above constraints have been overcome by the large amount of capital injection undertaken by both national governments and the World Bank.

The incremental or *in situ* approach is mainly used for infrastructure provision. Huchzermeyer (2001) maintains that the incremental approach is more likely to achieve social inclusion than large-scale redevelopment. It leads to minimal disruption of communities living in informal settlements. Critics of this approach question at what point infrastructure provision becomes more important than other aspects within settlements. The approach tends to place emphasis on individual elements at the expense of other elements. Abbott (2002a) maintains that the underlying conceptual model here is one that sees the whole (the wider settlement upgrading process) as being the sum of the parts (individual sector-based improvements).

### **1.3 More than Mapping**

A theoretical and empirical analysis of the following themes is presented in this research; 1) the upgrading process 2) stakeholder (including community) participation and 3) addressing existing challenges. With each of these themes, the integration of GI tools is explored along with their related impact. The main objectives of informal settlement upgrading are to improve the community conditions, ensure that residents participate and benefit in the process and that the programmes are affordable. The severity of conditions in many informal settlements necessitates action by governments, organisations and

communities alike. Community participation is considered essential where upgrading affects individual households.

### **1.3.1 Upgrading process and integration of Geo-Information tools**

The significance of GIS tools in the upgrading process is demonstrated in the design and implementation of many citywide upgrading programmes. According to Acioly (2009), the upgrading process in many African and Latin American cities follows a general pattern and rationale, where cities initially conduct a situational analysis of the problem and develop an approach for addressing the issues within a policy framework. Developing a situation analysis and profiles of settlements is best carried out with the support of spatial data. Cities carry out situation analysis using aerial photographs or satellite images to identify, locate and define patterns of informal development, at the beginning of the process. Community mapping, enumeration and settlement profiles in this case enable governments to assess whether upgrading is the best option (Acioly, 2009).

Upgrading processes rely on an extensive knowledge of the community, derived from sources such as socio-economic surveys. Other sources include experiential knowledge contributed by community groups and organisations. The ability to manage all of this information is made possible through the extensive use of a geo-spatial information management system constructed around a GIS interface (Abbott, 2002b). The process from an organizational perspective includes stakeholders and consensus decision-making, partnership between community and other stakeholders and community-based participatory planning (Abbott, 2002b). This process as pointed out by Boonyabancha (2005) is “demand-driven by communities” as it supports communities who are ready to implement improvement projects. The approach helps trigger acceptance of low-income communities as legitimate parts of the city and as partners in the city’s larger development process. According to Huchzemeyer (2006), this symbolizes a paradigm shift in the upgrading process which is defined by social inclusion and support for community involvement.

### **1.3.2 Participation and Community Empowerment**

Inclusionary discourses maintain that participants in planning processes should be able to collaborate to change their existing conditions (Healey, 1996; Forester, 1989). The participation of citizens is seen as the democratisation of planning and development

processes. Without the involvement of citizens, not much would be achieved in the development arena, as pointed out by Hardoy and Satterthwaite (1989).

*No local government is likely to respond effectively to the diverse needs of poorer groups unless there are effective channels for citizens to influence government policies and priorities (Hardoy and Satterthwaite 1989:139).*

According to Smith (1984:255) the idea of using GI tools for helping interested groups in the general public to become more involved in managing their own “backyard” emerges from the basic democratic maxim that those affected by a decision should participate directly in the decision-making process; an issue at the heart of democracy. Smith maintained that GI technology held the promise of an exchange platform for synthesizing expert knowledge with lay participant experiences. Similarly the underlying justification for integrating these tools to enhance participation is based on the assumption that GI technology could provide a critical complement to grassroots efforts that are undertaken to empower communities (Corbett and Keller, 2005; Kyem, 2004). The potential advantages associated with GIS applications are not a preserve of professionals and power brokers but could be harnessed by the more marginal sectors of society and could serve to empower them (Harris and Weiner 1998). An explicit link between power and information is seen where the ability to communicate self-originated information can place individuals, groups, and communities in stronger positions (Harris, 1998; Chambers, 1994).

This research explores how the integration of GI tools provides platforms for participation by communities as well as the documentation, control, and use of this information. It goes further in understanding how, in the process of using such tools, communities get empowered at individual and community scales. The discussion also delves into emerging ethical issues regarding control and ownership of the process.

### **1.3.3 Addressing existing challenges**

Abbott (2003:578) sees the need to recognise that the primary objectives of settlement upgrading have to be the social and economic development of the community. If GI tools are to be used effectively, it is therefore important that they support this process. The tools should not be regarded as a technical tool to underpin physical development. He further pointed out that instead, they should be seen as instruments that can liberate local authorities, communities and professionals from the constraints of a paper-based

approach, and allow for interaction between the spatial and physical elements on the one hand, and social and economic opportunities on the other, in a three-dimensional virtual environment. This way an environment where all actors can work in an interactive way to address the multi-faceted nature of informal settlements is assured.

Managing informal settlements involves, amongst other things, planning and controlling where they are located and how and where they expand; improving the social, economic, and basic health conditions in them; and ensuring that residents in these settlements and neighbouring communities enjoy social justice. Informal settlements present certain unique challenges in this respect, due to their complexity and frequently changing social conditions. To address these issues, urban managers require up-to-date and accurate, data (social and spatial) (Barry and R  ther, 2005; Sliuzas, 2004; Mason, 1997). Martinez (2009) sees GIS and indicator frameworks as being able to monitor inequalities, target deprived areas, set priorities, and reallocate resources. This clearly shows the potential of GI tools.

However, the integration of GI tools into planning processes has been subject to critique. Critics have associated GIS-related techniques with information abuse, control, exploitation, and elitist practices (Clark 1998; Dunn, 1997). There are claims that the tools have disempowered or marginalized communities through the complexity of the technology, its high associated costs, the inaccessibility of the data, the inability to use the technology to record diverse ways of understanding space, and a lack of genuine community participation (Kyem, 2002 ; Rundstrom, 1995).

This study is informed by the above discourse and sets out to explore how GI tools can provide platforms for enhanced participation by communities and for addressing existing challenges within informal settlements. The outcome is a recommended framework for upgrading which is inclusive and responsive and integrates GI tools. The research also takes cognisance of emerging ethical issues which underline the integration of GI tools in upgrading and planning activities.

#### **1.4 Research Aims, Objectives and Questions**

The research provides an understanding of the tools, approaches and methods, challenges and outcomes that define the integration of GI tools in upgrading processes. It

is anticipated that the lessons from this study can be used for further studies, research and programmes; especially with regard to the institutions and people involved in upgrading informal settlements in Nairobi and other cities in the region. Furthermore, an intrinsic aim of this study is to contribute to the need for identifying processes that enhance social inclusion and participation and provide suitable frameworks to help stakeholders in their quest to improve the lives of those living in informal settlements.

The overall aim of this research is to explore how the integration of GI tools in informal settlement upgrading processes provides platforms for: 1) enhanced participation of communities and 2) addressing existing challenges. To this end, the research sets out the following objectives and questions to develop the argument and provide comprehensive analysis.

**Objective1:** *To examine informal settlement upgrading processes through the integration of GI tools and the role played by the various stakeholders.*

**Objective 2:** *To examine how effectively the integration of GI tools in upgrading processes provides a platform for participation by communities.*

**Objective 3:** *To examine how the integration of GI tools in upgrading processes can be used to improve living conditions within informal settlements*

**Objective 4:** *To develop an inclusive and responsive framework for integrating GI tools in settlement upgrading.*

## **1.4 Research Questions**

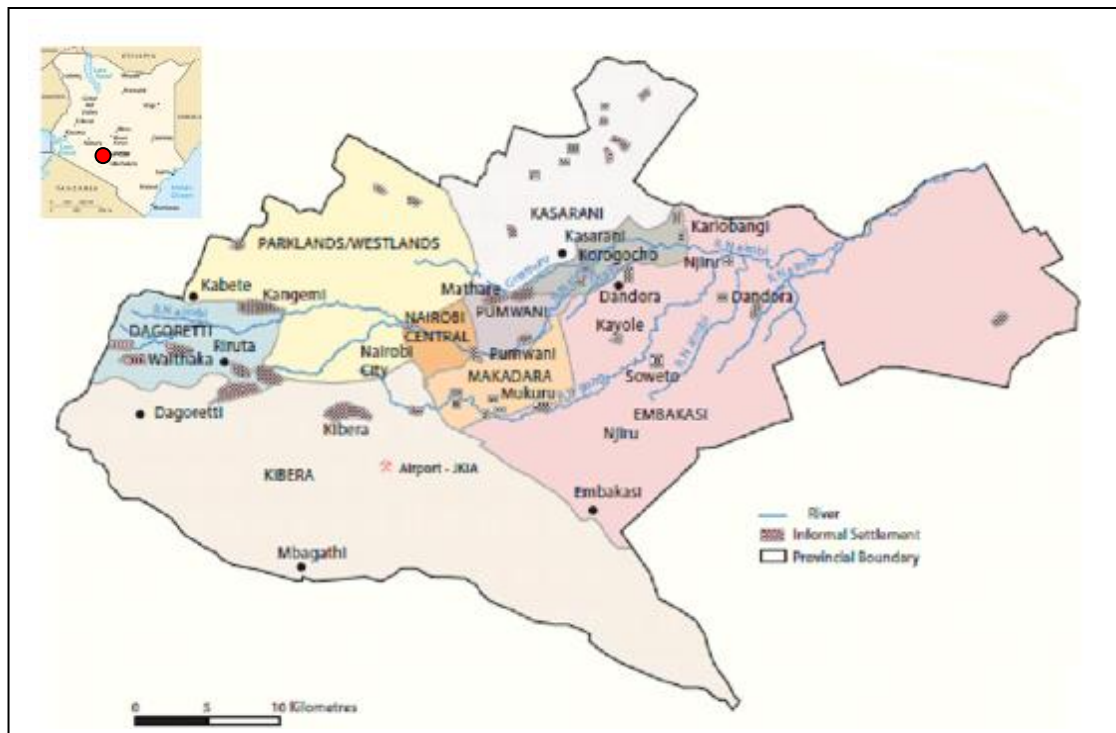
- 1.How useful are GI tools to the upgrading process?
- 2.Does integration of GI tools support inclusive participation in settlement upgrading?
- 3.Do GI tools provide effective platforms for addressing challenges in settlements?
- 4.What are the ethical implications of integrating GI tools in upgrading processes?

## **1.5 Research Setting**

Nairobi City enjoys the status of being an important political and economic hub in Kenya and the region. Although the city is attractive for human settlement and investment, its



rapid growth has led to urban management challenges. At independence in 1963, only one Kenyan out of every 12 (8%) lived in urban areas.<sup>4</sup> However, by the 1999 and 2009 population censuses, the proportion of the urban population had increased to 17 and 36 % respectively, affirming that one out of every three Kenyans currently live in urban areas according to the Government of Kenya (2010). Much of Nairobi's urban footprint is unplanned settlement driven by rapid population growth and urban poverty, among other factors (**figure 1**). Sprawling informal settlements handicap the city's delivery of social services and negatively impact the quality of life. The settlements date back to before independence and house a large, low income population. In the early 1990s, it was determined that over 50% of the city's population was living in unplanned settlements (UNEP, 2009). Informal settlements in Nairobi city house over 40% of the city's population, although they only occupy 5.8% of all land area, Matrix, (1993).



**Figure 1-2 Nairobi City: Location of Informal Settlements** Source: UNEP 2009

<sup>4</sup> Urban areas were designated as market centres, towns, municipalities and cities with a minimum population of 2000 people

Many of the informal settlements in Nairobi are located on land set aside for infrastructure way-leaves, riparian reserves and potential flood plains. The high population concentration within these settlements has significant environmental implications for existing land-uses and ecosystems, mainly attributed to their lack of basic infrastructure services. The potential impact of informal settlements on the environment in Nairobi, for example from poor solid waste disposal and discharge of human waste into nearby rivers, is well documented (Weru, 2004; Alder, 1995). Similarly, the associated health implications have been highlighted (Ziraba et al., 2009; Gulis et al., 2004; Amuyunzu-Nyamongo and Taffa, 2003; Lamba, 1994).

The growing numbers of people living within informal settlements and in poverty in Nairobi has attracted local and international concern, leading to upgrading programmes aimed at improving living conditions within the settlements. Upgrading programmes are supported by the Kenyan Government, non-governmental organisations, international development agencies and community based organisations. They vary from large-scale comprehensive programmes aimed at addressing the provision of basic infrastructure and secure tenure, to small-scale upgrading programmes focused on one or two aspects, such as water and sanitation improvement. Three settlements (Korogocho, Mukuru and Mahira) were selected for further detailed analysis. Korogocho represents a large-scale comprehensive programme with support from Government and international development agencies; Mahira is a small-scale comprehensive programme supported by the Pamoja Trust, a local non-governmental organisation (NGO); and Mukuru is a small-scale upgrading programme focusing on improving environmental health conditions and supported by Goal-Kenya, an NGO. In these three cases, GI tools were used to support the upgrading process. The research explores how the tools enabled the stakeholders' to address existing challenges as well as providing platforms for enhanced participation by communities.

## **1.6 Methodology**

One of the intended outcomes of this research is the development of an inclusive and responsive framework (integrating GI tools) to support informal settlement upgrading processes. This applied research approach was used to provide solutions to the contemporary issue of challenges facing informal settlements within urban settings of

developing countries. Using pragmatism and a mixed-methods approach to research, three informal settlements at different upgrading scales and their key actors were studied. Their selection was based on the need to understand how the integration of GI tools supported stakeholders in addressing existing challenges and also providing platforms for inclusive participation.

My previous professional and personal experience played a role in determining the choice of settlements and tools for the study. Experience gained from previous work in the settlements helped to shape my understanding on how GI tools were integrated in the upgrading processes. The contacts established in the course of my work within informal settlements directed me to the cases being examined during the research. Entry into the settlements and communities was “*cushioned*”. I was able to communicate my purpose and the communities were eager to support the inquiry. The main methods used for data collection were focus group discussions, semi-structured questionnaires, action planning, observation and photography. Documentary sources provided secondary literature to support empirical findings.

The research design uses an interpretivist approach to understand the application and outcomes associated with the integration of GI tools (often associated with positivist discourses), in order to explore their impact on upgrading processes. Both theoretical and empirical studies led to the development of a framework for the integration of GI tools in upgrading processes. The study is constructed with three main parts: a conceptual dimension, an empirical dimension and a technical and policy oriented dimension (**figure 1.3**).

The conceptual dimension is explored in the first four chapters. Background theories and literature on the upgrading and integration of GI tools are reviewed. Literature on GIS, planning and participation, as well as settlement and community mapping, is used to develop conceptual and theoretical frameworks supporting the research. The literature is then used to develop a methodological framework supporting the research. The empirical dimension examines how GI tools enhance community participation and help to address existing challenges. The key focus is the development of an operational framework for the integration of GI tools in upgrading processes.

## **1.7 Justification of Research**

The 2009 United-Nations Millennium Development report observes that despite some advances, sub-Saharan Africa remains the region with the highest prevalence of informal settlements. The settlements and urban areas are growing at an equally rapid pace, and the living conditions are severe, often involving multiple deprivations (United-Nations, 2009). Improving the living conditions within slums will result in better health and ensure communities living within these settlements are fully integrated into the urban economy. These among other reasons justify why local governments and international development partners have interest in addressing challenges of informal settlements.

Abbott (2002) based on experience in South Africa, demonstrates that development partners and local authorities in partnership with the communities developed a method-based approach to informal settlement upgrading that could be used as a replicable model in developing country contexts. According to Abbott, the starting point is the recognition that large-scale, replicable upgrading of informal settlements is only possible through the use of spatial information technologies. This Geo-information supported method was used to empower the community, both through the provision of detailed information on the setting and also use it to support their negotiations with the local authority. It is important to take into account other aspects like community support / acceptance and policy environment which contribute to the overall success of upgrading programmes.

Barry and Ruther (2005:43) observe that managing informal settlements involves, amongst other things, planning and controlling where they are located and how and where they grow; improving the social, economic, and basic health conditions in them; and ensuring that residents in these settlements and neighbouring communities enjoy social justice. To addressing all these issues, urban managers require up-to-date, accurate, data (social and spatial).

Although the use of Geo-information technologies for informal settlement upgrading and related urban planning activities is widely recognised (Hasan, 2006; Aksoylu, 2005; Glöckner et al., 2004; Sliuzas, 2004; Ceccato and Snickars, 2000), it is emerging that literature and case studies on application of GIS for settlement planning in sub Saharan Africa is less abundant. Moreover, there are more cases illustrating the integration of GI tools in rural development, than in urban situations (McCall, 2003:553).

The use of Geo-information technology can help in targeting resources to the most deserving cases or neediest areas, and thus contribute directly to residents' welfare. Martinez (2009) sees GIS and indicators as being able to monitor inequalities, target deprived areas, set priorities, and reallocate resources. The lack of accurate information has been blamed for the lack of action by city managers regarding improving living conditions in settlements (Satterthwaite, 2003b; Joshi *et al.*, 2002).

At the local level, the need for settlements and communities residing in them to be recognised as part of the larger city fabric is important. To this end;

*Politics is seen important as it determines the extent to which people trust their local and national government. To get public services, schools, health services, clean water, you need to be on the map. But the map also tells state authorities where you are, which may not be so attractive (Abbot *et al.*, 1998:4)*

Tools that employ enumeration, mapping and surveys of slums are key instruments for community empowerment and mobilization. The outputs from these activities are used to explore solutions and negotiate with relevant authorities. Enabling communities to map their environment and proceed further to push their agenda symbolises significant changes in the decision-making landscape. From being viewed as powerless and excluded from planning processes, communities in settlements are able to actively participate in decision-making. Although GI tools are capable of empowering communities, they are equally blamed for disempowering others (Chambers, 2006; Elwood, 2002). The research aims to explore how the integration of GI tools impacts on the subject matter of participation and improving living conditions within settlement upgrading process in Nairobi, Kenya. It is expected the findings will contribute towards encouraging actors to integrate the tools with a hope of improving upgrading approaches in the future.

Therefore, it is timely for this research to take place. This research will contribute to further understanding how best to integrate GI tools to support upgrading efforts, from the perspective of a capital city in a developing country.

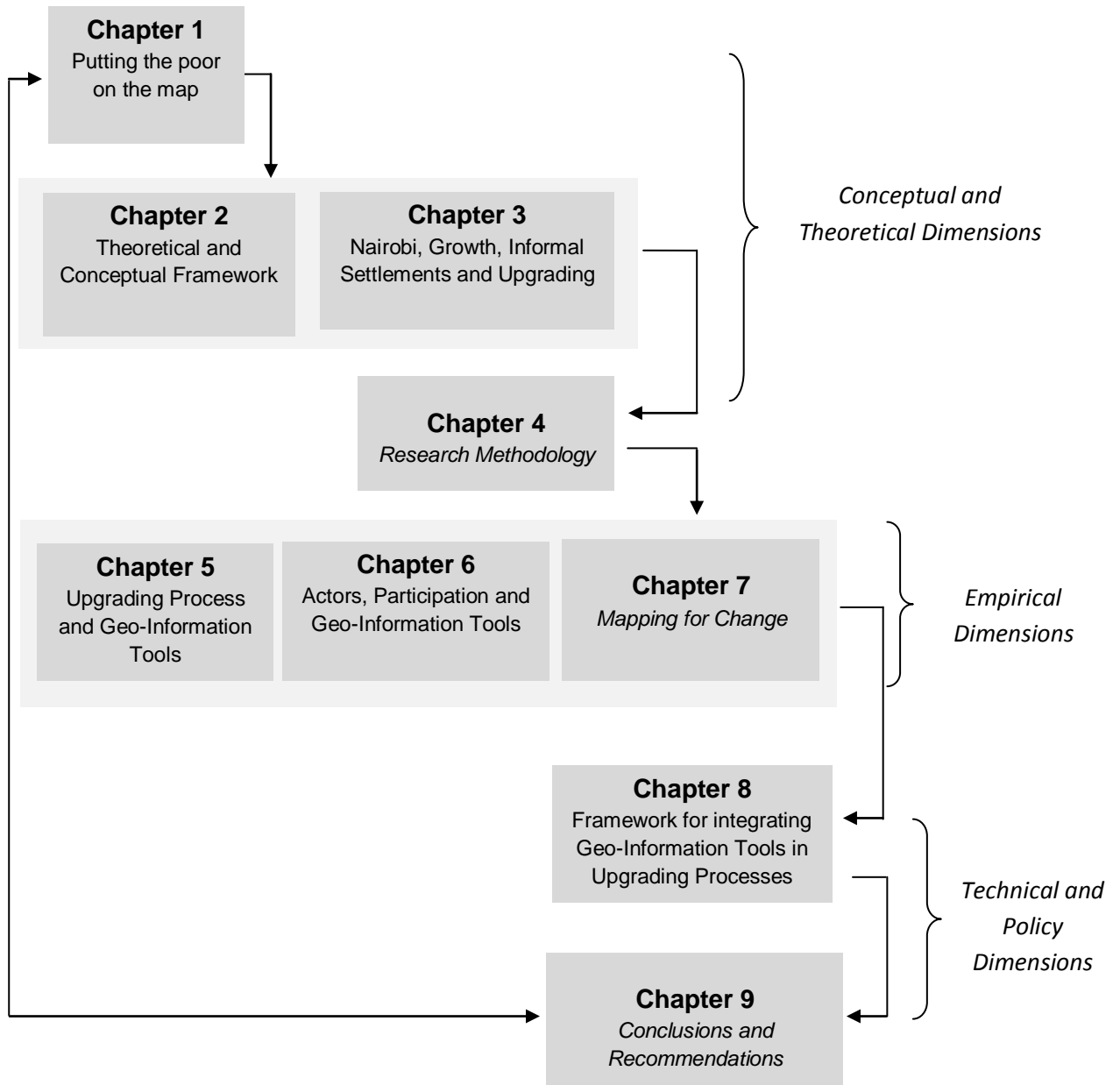


Figure 1-3 Research Design in Relation to the Thesis Structure

## 1.8 Structure of the Thesis

The thesis is divided into three parts (**figure 1.3**). In the first part are the introductory chapters: 1, 2, 3 and 4. Chapter 2 reviews the literature on settlement upgrading and cases of integration of GI tools. Conceptual and theoretical frameworks are developed based on the key elements explored. Emphasis is placed on exploring how GI tools 1)

enhance participation in upgrading activities, especially by communities living within informal settlements and 2) help stakeholders address existing challenges within the settlements.

Chapter 3 provides the background context for where the growth of the City of Nairobi is analysed. A spatio-temporal analysis of informal settlements reveals the fast growth of settlements, which is characteristic of many cities in sub Saharan Africa. This growth and its implications on the socio-economic landscape in Kenya prompted action by the Government and development partners to initiate settlement upgrading programmes.

Chapter 4 discusses the methodology and research design supporting the research. Data was obtained by way of focus group discussions, key informant interviews, observation and review of literature from secondary sources, including grey literature. Three case settlements were studied in detail where communities and members of organisations involved in upgrading within the settlements were interviewed. The data collected was used to develop the analysis chapters, as well as the framework for integration of GI tools presented in Chapter 8.

The second part of the thesis which is the empirical dimension of the thesis consists of Chapters 5, 6 and 7. Chapter 5 discusses the upgrading process by outlining the key stages of upgrading in the three settlement cases of Korogocho, Mahira and Mukuru. The integration of GI tools is explored along with the roles played by stakeholders. This chapter sets the stage to appreciate the participation elements and also how the tools are used to address existing challenges.

Chapter 6 explores participation aspects. The focus is on the role played by communities and how GI tools enhance participation and shape the social landscape. The chapter discusses how GI tools lead to the empowerment of communities which previously had little role to play in decision-making structures.

Chapter 7, 'Mapping for Change', explores how GI tools help communities and organisations understand the magnitude of challenges existing in settlements. The visualisation and quantification of challenges presents stakeholders with information on which to base their decision making.

Drawing from experiences analysed in the empirical chapters, a framework for integrating GI tools in upgrading processes is presented in Chapter 8. The GI supported framework is

based on an inclusive and responsive approach to upgrading settlements. The role of different stakeholders is presented, as well as the policy and institutional implications.

Chapter 9 recaps the research questions and main findings. A theoretical viewpoint is presented regarding the interplay between information and human users. Technology helps to shape society and the development landscape, but on the other hand, the prevailing social, economic and cultural landscapes are vital aspects governing settlements and upgrading processes. In conclusion, the chapter identifies areas for further research.







## **Chapter 2**

Definitions, Foundations and  
Frameworks

## **Chapter2: Definitions, Foundations, and Frameworks**

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## **2.1 Introduction**

This research seeks to understand the integration of GI tools into upgrading processes and their impact on the following elements: firstly the “upgrading processes”, secondly, “participation by stakeholders” and finally, “addressing existing challenges”. In the subsequent sections these concepts are theorised under the relevant heading.

In Part 1, definitions have been provided for the key terms used in the research, including informal settlements, upgrading and GI tools.

The second part examines the theoretical framework and debate surrounding the key concepts of the study. The theoretical background will be used to support the data analysis presented in Chapters 5, 6 and 7. There is an appraisal of the dynamic landscape that characterises upgrading approaches across the world.

In the third part of the review, a reflection on the emerging issues and research gaps is presented. Issues emerging from the literature have been synthesized and used to develop the framework for investigation. The conceptual framework is developed to support the research and analytical chapters.

## **2.2 Definitions**

### **2.2.1 Informal settlements**

Informal settlements, often referred to as squatter settlements or slums, are dense settlements comprising communities housed in self-constructed shelters, sometimes under conditions of poor access to utilities and informal land tenure. Additionally they may have no legal claim to the land and do not follow building regulations. The origin of these settlement types may be traced to the mid 18<sup>th</sup> century industrial revolution. Owing to advanced technology and change in production modes, rural populations were attracted to urban areas often to live in congested shelters. These were the typical living conditions of the working class (Hoskins, 1970).

From their early origins, these settlements have been beset with derogatory associations, such as crime, squalor and apathy. However the different definitions provided have a common thread. UN-Habitat (2003a) for example has developed an operational definition restricted to the physical and legal characteristics of slums. According to UN-Habitat, a

slum is characterized by inadequate access to safe water, sanitation and other infrastructure, the poor structural quality of housing, overcrowding and insecure residential status. This notion can also be used for defining the communities living in informal settlements, which are simply individuals living under the same roof lacking one or more of the aforementioned conditions. This definition, however, does not take into account the underlying causes of slums, such as their social aspects and other individual heterogeneities and resource distribution aspects. This suggests that a universal definition of such settlements that includes all their aspects and diversities, is unlikely to be possible.

Durand-Lasserve (2006:1) regards the term “informality” as raising the same definitional problems for human settlements as when it is applied to economic activities and to employment, that is, it is defined negatively. Its main characteristics are known, but in many situations the borderline between formal and informal remains blurred. The author maintains that a settlement with the same characteristics regarding land, urban planning, and housing (depending on the contexts and public authority interpretations), can be considered either as formal or informal. According to Nawagamuwa and Viking (2003), there is no single definition for informal settlements. However, drawing on Desai and Devadas’ (1990) work, Nawagamuwa and Viking contend that the term is used to denote large gatherings of usually poor people trying to eke out a living. According to them, informal settlements normally manifest the characteristics of both slums and squatter settlements and usually involve improper or illegal acquisition of the land occupied. Consequently, they use the term as synonymous with the idea of a slum or squatter settlement (Nawagamuwa and Viking 2003). In this thesis, the use of the term informal settlement follows Nawagamuwa and Viking to denote a settlement with the above characteristics, irrespective of the way the settlement’s land has been acquired and the degree of security of tenure the residents have over their properties.

The extreme diversity between different informal settlements or slums and the various connotations attached to them have meant that the term eludes a universal definition. Taking the example of Latin American cities, these use many different names to describe their informal settlement or slum areas. In Brazil, Chile, Costa Rica, El Salvador, Paraguay, Venezuela, Mexico and Peru they are known respectively as: favelas, poblaciones callampas, precarios, tugurios, rancherios pobres; and barrios de ranchos, colonias populares and barriads or pueblos jovenes (Imperato and Ruster, 2003). In

South East Asia, these settlements have different names such as chawls/chalis (Ahmedabad, Mumbai), ahatas (Kanpur), katras (Delhi), bustee (Kolkata), zopadpattis (Maharashtra), cheris (Chennai), katchi abadis (Karachi), and watta or pelpath (Colombo). In Africa the following different names emerge: umjondolo (Zulu, Durban), mabanda (Kiswahili, Tanzania), vijiji (Kenya).

### **2.2.2 Upgrading**

Upgrading, often referred to as urban or slum upgrading, is broadly defined as physical, social, economic, organizational, and environmental improvements undertaken cooperatively among citizens, community groups, businesses, and local authorities to ensure sustained improvements in the quality of life for individuals (Cities Alliance, 2002). According to the World Bank (1999-2001), although upgrading approaches might differ from city to city, in their simplest form they deal with the main deficiencies determined in the definitions of informal settlements provided earlier. Therefore, upgrading consists at its simplest of a package that improves basic services such as water supply, sanitation, sewage disposal, garbage collection and electricity. Further actions include legalization and regularization of property rights, also called providing security of tenure. Security of tenure is considered to be one of the essential actions for upgrading, since it opens up possibilities of raising credit for livelihood related activities (UN-Habitat, 2003:VI). However, it is also known to be among the most difficult changes to effect, since it requires alterations or flexibility in governmental mechanisms and legislation. At the neighbourhood level, upgrading may include the improvement of footpaths, roads and public spaces. Additionally, further actions include the removal of environmental hazards and providing incentives for community management and maintenance or investment in capacity building. The public sector in this case has a responsibility to provide basic infrastructure, while housing is a matter of enabling people to themselves improve their conditions (Tannerfeldt and Ljung, 2006:53). Furthermore, it has been confirmed that after the provision of services and infrastructures and the guarantee of security of tenure, communities in these settlements have been motivated to invest up to four times the amount of funds that governments invest in infrastructure improvements for these areas (World Bank, 1999-2001).

Settlement upgrading is also favoured because it involves less clearance and relocation, thereby avoiding the social and economic disruption to the community that would occur if residents were resettled in new areas (Hamdi and Goethert, 1997:8). In addition results

are highly visible in a very short period of time and make significant differences in the quality of life of the urban poor, as well as helping them to start to becoming integrated within the city fabric.

### **2.2.3 Geo-Information tools**

Geo-Information tools otherwise referred to as geographic information tools are technologies for collecting and dealing with information of a geographic nature. The main terms associated with these tools include Global Positioning Systems (GPS), remote sensing and Geographic Information Systems (GIS).

GPS is both a system and a set of tools that permits the direct measurement of position on the earth's surface, for example with regard to latitude/longitude or standard systems. The system relies on signals received from satellites orbiting the earth and transmitting timed signals. Remote sensing is the science of identifying, observing, and measuring an object without coming into direct contact with it. Importantly it is the science of capturing information regarding the earth's surface and atmosphere using satellites or aerial photography methods. A Geographic Information System is a computer based system for the input, storage, manipulation and even visualisation of geographic information. Longley *et al.*, (2005:11) describe Geo-Information as any information which can be linked to a specific point on the Earth's surface.

With current technological advances, it is possible to use ground-based and airborne sensors, combined with information and communication technology, to collect, process, analyse and disseminate data about processes occurring on earth. The assembly of methods, approaches and devices developed and under development for dealing with the above challenges is called Geo-Information technology (Lemmens, 2011). While maps linked to data are useful, the real power of Geo-Information technologies is based in their capacity to facilitate analysis, not merely display information (Gatrell and Jensen, 2009).

In this research the term 'Geo-Information tools' is used to refer to the hardware, software, data, information and processes as applied to support settlement upgrading and planning functions. Aerial photographs and satellite images which are products of remote sensing are used by stakeholders to visualise spatial patterns of settlements. GIS software is used to analyse data (spatial and attribute) relating to the settlements, in the process producing models depicting settlement characteristics. The process of developing

spatial models starts with the collection of data using tools like GPS and analysing it using computer based platforms. These platforms offer visualisation capabilities which users and decision-makers rely upon to understand settlement dynamics.

### **2.3 Upgrading Elements: The Foundations**

Urban upgrading is defined as the improvement of physical, social, economic, organizational, and environmental aspects within informal settlements. It may also be defined as "a systematic attempt to improve living conditions for people residing in informal settlements" (Taylor and Cotton, 1993:xi). This includes water and sanitation, solid waste removal, a circulation system (roads, lanes, and footpaths), storm-water drainage, electricity, health and education facilities, community halls, and recreation facilities (van Horen, 2004). Gulyani and Connors (2002) further observe that the primary goals of upgrading projects are to provide secure land tenure in informal (and often illegal) settlements, and to improve basic infrastructure and service delivery. Fundamental to all upgrading of low-income settlements is the physical infrastructure that is either improved, or put in place. The World Bank (2001) maintains that upgrading or slum improvement in low income urban communities, at its simplest, is the provision of a package of basic services (clean water supply and adequate sewage disposal to improve the well-being of the community). In addition, upgrading deals with regularizing security of land tenure and housing improvements *in situations* of insecure or unclear tenure (World-Bank, 2001). The improvements are undertaken cooperatively among citizens, community groups and organisations, non-government organisations and businesses, and local authorities to ensure sustained improvements in the quality of life for individuals (Cities-Alliance, 2002).

It is argued that upgrading has significant advantages: not only is it an affordable alternative to clearance and relocation (which cost up to 10 times more than upgrading), but it minimizes disturbance to the social and economic life of the community (van Horen, 2004; Gulyani and Connors, 2002; Davidson and Payne, 2000). The results of upgrading are highly visible and immediate and make a significant difference to the quality of life of the urban poor (UNFPA, 2007). Poor living conditions and their associated ills remain a major and growing challenge in cities all over the developing world. According to UNFPA (2007:16), one in three city dwellers, that is, a billion people, or a sixth of the world's population, live in such conditions, hence justifying upgrading-related interventions.



Davidson and Payne (2000) argue that the major issues in upgrading projects centre around four main aspects: 1) The nature of the target population and in particular the most disadvantaged groups; 2) the physical nature of the project site and prevailing land tenure arrangements; 3) the nature and level of site development and 4) the institutional and financial framework. In reality, there is a great diversity between different settlements in the problems that arise, therefore local priorities are used as the basis for decision-making and planning. The authors further maintain that engaging communities in setting the agenda for improvement helps the relevance of the project. Payne further points out that:

*The real challenge is two-fold. First, there is a need to improve the living conditions of more than 100 million people living in slums [...] and second, there is an equally urgent need to create conditions in which all sections of urban society, especially the poorest and most vulnerable, can obtain access to legal, affordable and appropriate shelter in ways that prevent the need for future slums and unauthorized settlement.* (Payne, 2005:136).

Van Horen (2004) presents a summary of the key elements of upgrading, including the physical, socio-economic and political/legal aspects (**figure 2.1**). According to Van Horen, upgrading ideally involves addressing the basic services, and access to credit/finance, within an established legal and institutional framework. However, in some countries, the institutional and legal challenges hinder inclusive approaches to upgrading.

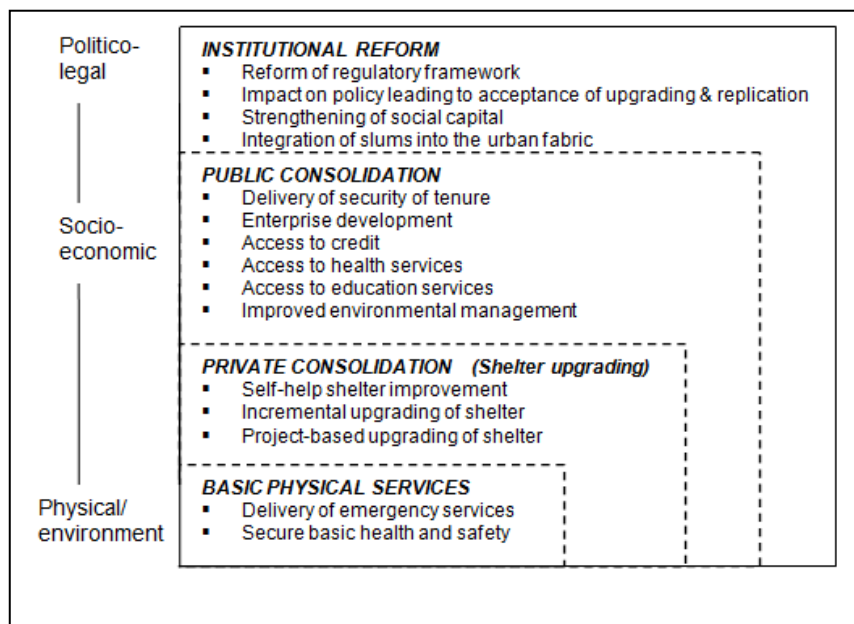


Figure 2-1 Elements of Upgrading

Source: Van Horen (2004:1)

## 2.4 Upgrading Approaches

Abbott (2002a:309) argues that the origin of the intervention is less important than the substantiation of the approach. This has led to the emergence of two distinct routes to the evolution of upgrading approaches, namely: the empirical and the theoretical routes.

According to Abbott, the empirical approach is strongly rooted in practice and is experience-driven. The approach relies on studies to identify strengths and weaknesses, and to determine more appropriate methods of operation, following which a revised programme is implemented. The approach was used by DFID<sup>5</sup> in India in addressing physical infrastructure issues in informal settlements and the UNCHS (Habitat) best practices programme. The approach has been further developed in the area of infrastructure provision, through the progressive improvement model (Choguill, 1999; Choguill *et al.*, 1993 ). The other area of empirical approach evolution is community based planning, with the supportive framework being community action planning or micro planning (Hamdi and Goethert, 1996).

The theoretical route according to Abbott (2002a) works with real projects and seeks to create a theoretical construct that explains the process as it is happening. In this case, theory and practice are complementary. The approach is, however, limited to Latin America. The merits of the approach are clearly demonstrated in a study of the holistic planning approach (*plano global*) in Belo Horizonte, Brazil (Abbott, 2002a). In using the criteria of tested projects and a well-documented process to define appropriate intervention strategies, Abbott (*ibid*: 309) highlights three emerging models, namely:

- The progressive improvement model of infrastructure provision
- The micro-planning model and
- The construction of a holistic plan.

### 2.4.1 The changing landscape

Initial research, for example by Abrams (1964) and Turner (1976), based the housing theory's growth patterns and construction methods on empirical data gathered from informal settlements in Latin America. The settlements in Latin America were pioneers in

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<sup>5</sup> See Cotton & Franceys, (1991) and Taylor & Cotton (1993) as quoted in Abbott (2002b)

developing responses in place of the previous approach of the mass removal of squatters. These approaches were later adopted by donor agencies to help in the formulation of policies to address inadequate shelter in developing countries (Napier, 2002). Responses to informal settlements within developing countries have been influenced by the neoliberal policies of international funding bodies, such as the World Bank and the International Monetary Fund (Durand-Lasserve, 2000).

According to Pugh (1995), the dominant approach to informal settlements in the 1950s and 60s was one of demolition and replacement by public housing. This model of intervention had been adopted from developed countries, although with mixed results. Pugh maintains that despite this approach, the problem of informal settlements continued to escalate within developing countries. This prompted responses, for example, John Turner's approach, presenting informal settlements in a positive manner and portraying them as potential solutions to housing problems in the urban areas of developing countries (Turner and Fichter, 1969). Turner called for a shift to greater autonomy or dweller-, as opposed to government-, control in the production of housing.

Governments in Africa continued to provide public housing even after achieving independence. Mass housing projects in most countries stopped in the 1970s and were replaced by partial housing provision of various types, such as core housing and sites and service schemes (Siebolds and Steinberg, 1982 ). These new schemes however failed to match the demand for housing and this saw the introduction of various *in situ* upgrading approaches such as those in Lusaka, Zambia (Burgess, 1992; Laquian, 1983; Martin, 1983). Public housing programmes were still initiated but on a small-scale. Their high cost was beyond the reach of most urban poor. As a result informal settlements continued to grow, as land and infrastructure supply lagged behind demand (Napier, 2002). The failure of many approaches is also attributed to the continued dependence on building by-laws and codes based on European models, which are inappropriate to the needs of the African city (Majale, 2002; Simone, 2001).

Over the last 10 years the policy in some countries like Zimbabwe has been to bulldoze informal settlements and forcefully remove residents. This was also common in apartheid South Africa. Napier (2002) observes that, more often, governments would give *de facto* recognition to certain informal settlements or follow a crisis response approach, evicting people when informal settlements encroached on other (more powerful) urban interests.

Making reference to the experiences of Asia, Angel (1983) observed that informal settlement upgrading programmes were tried earlier and much learning and experience has been garnered there. Funding of upgrading schemes, for example, shifted from direct project funding, to sector based interventions (through new financial products offered by intermediaries, and other broad market interventions).

Gulyani and Conners (2002) have similarly presented an analysis of the changes within upgrading approaches in developing countries. However they went further by presenting the change in focus or entry points by governments. Firstly, they observed that upgrading projects had changed significantly in scale, scope, and structure over a 30-year period. In the 1970s, governments undertook large multi-sector projects that were ambitious both in scale and scope; but these evolved to more modest 'second generation' interventions that focused on selected sectors and fewer settlements. These early upgrading projects used the housing sector as an entry point and explicitly aimed to regularize land titles, improve housing, and invest in infrastructure. Lately upgrading projects have become infrastructure-oriented with less emphasis on either formal land titling or the house/structure itself. Secondly, despite the move away from formal titling components in Africa, upgrading projects in the region continue to be concerned with tenure security. Gulyani and Conners maintained that the mechanisms for enhancing tenure security have changed in terms of the sequencing. Earlier interventions regarded tenure security as a precursor for housing and infrastructure investment. Current programmes tend to use infrastructure investment as a means for enhancing tenure security and encouraging housing investments (Gulyani and Bassett, 2007:487).

#### **2.4.2 Informal settlements in Africa: from demolition to acceptance**

How do African governments deal with these "eye-sores"? Nkrumah built walls around them in Osu, Accra, to shield the eyes of visitors to the capital. They were declared "illegal settlements" in Ivory Coast. In June 2005 in Harare, Zimbabwe, policemen mounted the campaign "Operation Murambatsvina," which in Shona, meant "Operation drive out the rubbish." (In Defence of Slums; The African Executive 31<sup>st</sup> October 2007).

The immediate reaction of governments to the growth of informal settlements in many African cities was increased regulation and enforcement (Payne, 1989). Informal settlements were regarded as places of poverty, disease and criminality where only the

urban poor resided. The settlements were considered a challenge to the modernisation schemes within most cities and led to a decline in property values of formally developed neighbourhoods and commercial investments. In reaction most governments resorted to enforcing planning regulations, public health acts, and building codes to protect the formally developed areas of their cities; they attempted to discourage in-migration to these settlements and their further growth through demolition policies and campaigns of persuasion (World-Bank, 2004; Kubale-Palmer and Patton, 1988).

Owing to political pressure and the growth of civil society, there emerged a shift in key actors' attitudes towards informal settlements. Governments and planners alike saw the potential of many of the self-built structures to provide shelter to large numbers of residents already living in cities. Planners began to recognize informal settlement residents as industrious self-builders who needed only limited assistance from the state – mainly in the form of secure tenure and basic urban services – to be able to improve their own circumstances (World Bank, 2004). Keare and Parris (1982), for example, pointed out that the recognition of the positive attributes of informal settlements ultimately led to changes in urban policy with many governments formulating ways to accommodate existing informal settlements as part of the wider city fabric. There were deliberate efforts to facilitate settlement improvement by ensuring the availability of basic infrastructure and other services that enabled communities to improve their living situation by themselves (Keare and Parris, 1982). This ushered in the site and service schemes that provided shelter to urban poor groups in many cities across the developing world.

Despite the efforts to integrate informal settlements within the planning framework of cities, unfortunately, many governments remain anxious to demolish them (Gilbert, 2007). In this regard, settlement demolition and clearance continues and, subsequent to the 'cities without slums' initiative, large-scale demolition projects have been initiated in India, Kenya and Zimbabwe (COHRE, 2005a). In Zimbabwe, for example, the 'clean up' activities within its cities through Operation *Murambatsvina* led to more than 700,000 people "losing their home, their sources of livelihood or both" (COHRE, 2007:14).

In Kenya, the practice since independence in 1963 to the late 1970s was to demolish settlements without providing alternative shelter to the communities affected. During the 1980s, this changed to a more permissive approach and there were few demolitions (Weru, 2004:48). During the 1990s, there were incidences of demolition within Nairobi.

Notable demolitions took place in the 1990s in two large settlements of Muoroto and Kibagare, where more than 30,000 people were made homeless.

According to DuPont (2008:85), the clearance of settlements is counterproductive since it only results in relocating these settlements further from the city without necessarily solving the underlying lack of adequate shelter for the disadvantaged. Demolition entails the destruction of investments the poor have made in their housing and in improving their micro-environment, thereby systematically impoverishing the affected families. This hampers the efforts of settlement communities to construct their own shelter and subsequently improve their living conditions. The government policy of demolition in many cases pushed expropriated groups to invest in developing housing and settlements within increasingly perilous zones.

By comparison, in Turkey, the approach has been to demolish settlements and construct new residential units in the same or different areas. The model provides housing units to landlords, while giving an opportunity to squatters and needy people living in other parts of the city to buy only one housing unit with affordable and long-term payments in the newly constructed area (Uzun et al., 2010:209).

#### **2.4.3 Enhancing participation and improving infrastructure**

Despite efforts by governments in developing countries to prevent the growth of urban poverty, informal settlements have continued to emerge within city boundaries, because it is here that residents can access services and employment opportunities easily. According to the World-Bank (2002), the policies of moving people or replacing their physical facilities have not worked well over time. The Bank maintains that governments have had to spend resources clearing slums and transporting and resettling inhabitants, as well as facilitating access to employment in the central city. Informal settlements, like most of the problems confronting people living in poverty in the urban South, are the outcome of failed policies; inappropriate regulatory frameworks and administrative procedures; dysfunctional land markets; unresponsive financial systems; bad governance; corruption; and a fundamental lack of political will (Majale, 2002).

Historically, the 1970s were characterised by conventional approaches, where Governments, through a Ministry or an organisation as the lead agency, would be responsible for overall project management and the coordination of the inputs of other agencies and organizations. Participation by communities was limited to being informed

about project progress or consulted on specific issues or proposals. In such projects, where the community is seen as the target of the project and not as a key partner in the development process, the lead agencies and professionals tend to adopt technocratic approaches to infrastructure and services, yet fail to establish a local capacity for cost recovery, operations and maintenance (Werlin, 1999).

Van Horen (2004) distinguishes between community and comprehensive upgrading approaches based on scale. Community upgrading focuses mainly on the provision of basic physical services through to broader approaches that integrate socio-economic development, regulatory reform, and attempts to contribute to city-level institutional change. Community upgrading is a more participatory approach and provides an opportunity even for the poorest of the urban poor to participate in developing their neighbourhoods. Other advantages of community upgrading are that it involves the leadership and settlement residents in project planning and decision-making. This approach also involves limited disruption of the physical, social and economic fabric of low income settlements (Abbott, 2002b; Cities-Alliance, 2002; Mukhija, 2001; Skinner, 1987). Community participation in upgrading facilitates the long term sustainability of project benefits, by encouraging a feeling of ownership and responsibility (Werlin, 1999:1529).

Comprehensive approaches to upgrading on the other hand also include the building of a local economic base through the development of relevant knowledge and skills, and strengthening organizational relationships between CBOs, NGOs and local government structures. The more advanced approaches to upgrading also involve the reform of governance structures, with a view to putting in place more supportive institutional arrangements (Van Horen, 2004:1).

The World Bank's response to the housing and infrastructure challenges facing developing countries was to fund urban infrastructure and housing projects based on sites-and-services and *in situ* upgrading (Pugh, 1995:64). *In situ* upgrading, according to Ferguson (1996), impacted on the development scene in two ways. Firstly, it linked together sites-and-service schemes and slum upgrading as twin approaches; and secondly, the World Bank's approach emphasized the centrality of physical infrastructure to settlement improvement, and measured success in terms of hard service delivery. This further reinforced the notion that informal settlements could be treated in the same way as formally planned settlements.

Abbott (2002b) argues that following the linking together of slum upgrading and sites-and-service schemes as twin approaches, this became an approach that was generally applied to upgrading. However, this approach was seen to be ineffective. This prompted policy makers to embrace the provision of appropriate services, and the linking of service provision to affordability as a solution. This approach has continued to have a profound impact on the thinking around informal settlement upgrading today.

## 2.5 Integrating GIS tools in Upgrading Processes

*Large-scale, replicable upgrading of informal settlements is only possible through the use of spatial information technologies. The primary objective of upgrading has to be the social and economic development of the community. For GIS to be used effectively, it has to support this process. It is not simply a technical tool to underpin physical development [...] it should be seen as a tool that liberates local authorities, communities and professionals [...] and allows for the interaction between the spatial and physical elements on the one hand, and the social and economic opportunities on the other, in a three-dimensional virtual environment.* (Abbott, 2003:578).

According to Davidson and Payne (2000), the process of upgrading of informal settlements is composed of five main stages namely: feasibility studies, detailed studies, developing project options, detailed development proposals and project implementation. Other authors, such as Sliuzas (2003) and Acioly (2009), observe that the requirements for spatial information in the upgrading process present opportunities for the adoption of GIS tools.

Information and communication technologies (ICTs), particularly GIS, are regarded as one way to support integration of local knowledge and scientific information and to support spatial planning. Additionally, these tools enable users to manage large spatial datasets, while the integrated spatial analysis tools allow decision makers to make more informed decisions with the development of multiple scenarios (Freitas and Tagliani, 2009; Kyem, 2004; Isaak and Hurbert, 1997). For example, based on experiences in New Rest settlement, Cape Town, Abbott (2003) demonstrated how spatial information and GIS was valuable and could be applied in settlement upgrading. In this case spatial data related to the shacks (structures), their occupants and the physical conditions was analysed within a GIS environment. A settlement database linking structures,



infrastructure and demographic characteristics was developed and used to generate spatial models of the settlement. Aerial photos were used to provide additional spatial data regarding the settlement. Community surveys and observation methods were used to obtain demographic data and infrastructure data respectively. Abbott maintained that GIS facilitated a visual representation of spatial and attribute data, which provided the underpinning technology for informal settlement upgrading. Geospatial information management provides the framework for the wider upgrading to support negotiations with the local authority.

The use of aerial photography provides a useful source of information on settlements. Although informal settlements are highly dynamic, if taken regularly, aerial photos provide updated information which is useful for purposes of planning and monitoring throughout an upgrading process. Small format aerial photography may be a low-cost method of acquiring spatial data to support upgrading processes and the capacity of the majority of residents being to interpret aerial images of their own area is well recognized and documented (Sliuzas, 2004; Bruijn, 1987).<sup>6</sup> Images of settlements can be an important instrument in mobilization, providing residents with an overview of their locale, enabling the identification of problem areas and the exploration of possible solutions together with planners (Nostrand, 1986). Gonzales (2000) used aerial photos and satellite imagery for data acquisition in working with communities in the Philippines. Analysis of these images was carried out in a process she called “*participatory image interpretation*”.

Zeilhofer and Topanotti (2008:14) demonstrate how the use of GIS techniques permits the integration, query and visualization of multi-source and multi-scale data sets obtained from field surveys, spatial analysis, official statistics, and remote sensing techniques, relevant for the evaluation and monitoring of informal occupations and their upgrade processes. Aerial photography interpretation and digital elevation model (DEM) processing were useful for the physical parameterization of urban landscapes. Zeilhofer and Topanotti further observed that high resolution remote sensing imagery complements and may substitute aerial photographic surveys, thereby improving monitoring tasks in the rapidly changing urban fabrics formed by informal settlements.

Garstka (2009:92) observed that in an upgrading project in Kosovo, data obtained by way of community survey and aerial photos was entered into a database and GIS respectively

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<sup>6</sup> Work in informal settlements in Dar es Salaam shows how the use of Geo-information tools could contribute to community-based upgrading approaches. Sliuzas (2003:617) demonstrates current aerial photographs can be used as a source of information in upgrading by stakeholders.

allowing data to be mapped and spatially represented. This represents a good example of the collaboration between communities and local organisations and the city/municipal authority. A unique approach was adopted in this project, whereby data compiled was handed over to the community for authentication and reference. Garstka pointed out that this approach showed a move in the direction of '*action oriented*' urban planning, because the data did not remain in the hands of the municipal office, but was given back to the community it represented, allowing them to use it for their own purposes.

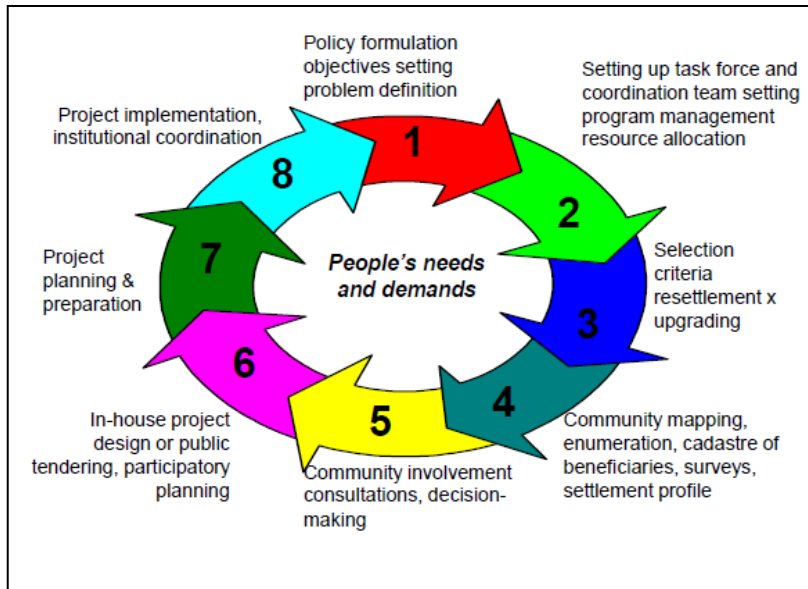
The dynamic nature of developments within settlements justifies the collection of relevant, current, and accurate social and spatial data in support of upgrading initiatives including land tenure security pose unique challenges, due to the dynamic nature that characterizes informal settlements. With this in mind, social and spatial data need to be collected frequently, at low cost, and, where possible, in a participatory manner (Barry and R  ther, 2005:51).

It is important to take note of critics concerning the use and application of GIS tools. Craig *et al.*, (2002), for example, argued that the tools have the potential to alienate and exclude non Geo-Information and technology experts. They further pointed out that the use of such technology carries the risk of undermining participation rather than promoting it, thereby creating the need for care and concern about such potential dangers in order for successful GIS-based joint learning in for planning collective action to be realized. Obermeyer (1998) and Sheppard (1995), further observe that GI technologies are seen as promoting positivist epistemologies. Similarly, as apprehended by Pool (1983), rather than being a "*technology of freedom*", these tools further marginalised the disadvantaged, who were unable to participate fully in the benefits of the spatial information revolution.

## **2.6 Settlement Mapping: Process, Actors and Impact**

Acioly (2009:15) argues that the upgrading process in many African and Latin American cities follows a general pattern and rationale as demonstrated in the informal settlement upgrading cycle (**figure 2.2**). Cities conduct a situational analysis of the problem and develop an approach for addressing the issues within a policy framework. Developing a situation analysis and profiles of settlements is best carried out with the support of spatial data. Aerial photographs or satellite images are used to identify, locate and define patterns of informal development, at the beginning of the process (which would be step 4 of the cycle described in the informal settlement upgrading cycle model). The significance

of GI tools in the upgrading process is demonstrated in the design and implementation of many citywide upgrading programmes. Community mapping, enumeration and settlement profiles (step 4) enable Governments to assess whether upgrading is the best option (Acioly, 2009:16).

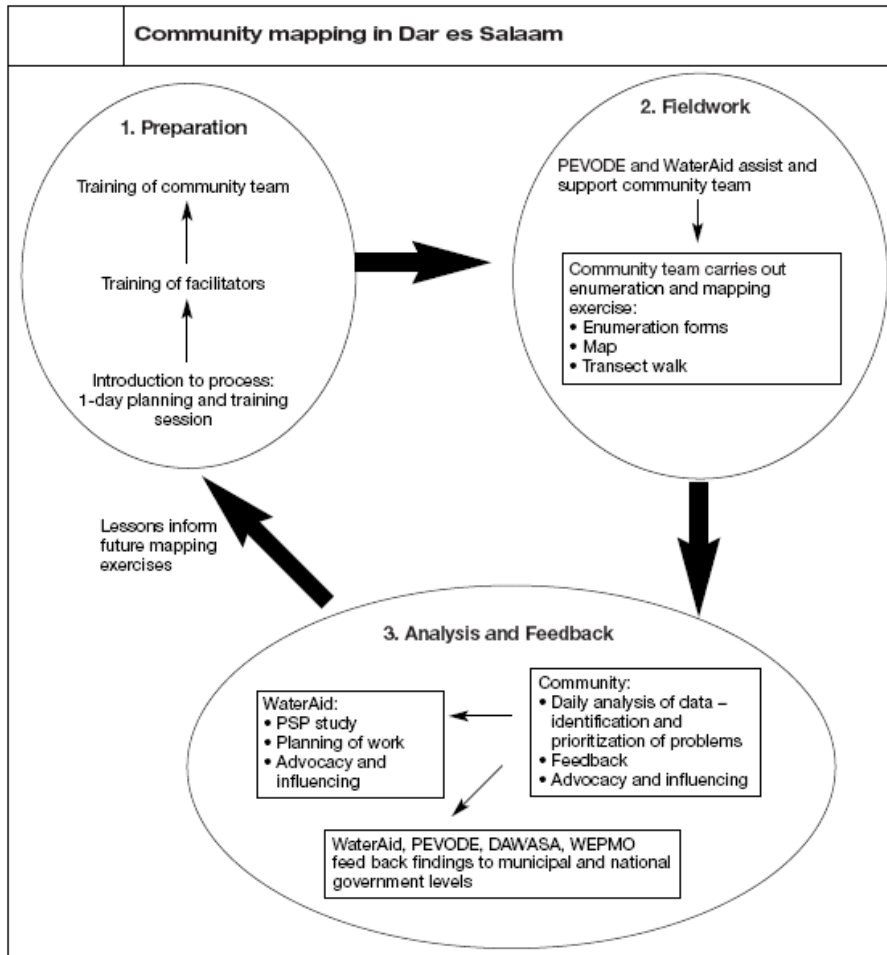


**Figure 2-2 Informal Settlement Upgrading Cycle** Source: Acioly (2009:16)

In a community mapping process supported by an NGO (Water-Aid) in the Keko Mwanga settlement, Dar-es-Salaam, participation by the beneficiary community was observed from the onset of the process right through to its end (**figure 2.3**). Community members were trained to use and apply GI tools for enumeration purposes as well as for the analysis of data collected. Regarding the process the community stated “*mapping has opened and empowered us to do anything now. It showed us a way*” (Glöckner *et al.*, (2004:196).

With reference to Cape Town, (New Rest settlement upgrading), Abbot (2003a) maintains that within any upgrading project there are two major groups of actors, the local authority, and the community to be upgraded. Depending on the setting and approach towards the upgrading, other stakeholders who may have an interest are observed. These may include, but are not limited to, surrounding communities, utility companies, professionals and NGOs. The effective role of GIS within this process can be realised if GIS integrates the spatial data management and programme/project management systems. The

integration of these systems is through the decision-making process which has implications for the issue of decision making within the upgrading process.



**Figure 2-3 Community mapping in Dar-es-Salaam** Source Glöckner, et al., (2004:189)

Hasan (2006:472) observes that in urban upgrading projects, where GI tools were used, planning agencies and local government had realized the importance of mapping settlements and the need to support such initiatives. The role played by local authorities and municipalities is crucial because without their support the process of upgrading would be an irrelevant effort by local community members. In an upgrading project in Kosovo, Garstka (2009) observed that local authorities and municipal governments had just as much desire to upgrade and regularize the settlements as the people. Similarly in Belo

Horizonte, Brazil, the local authority was one of the first Brazilian local authorities to implement an urban GIS to manage settlement growth and other municipal functions like tax and infrastructure maintenance. The upgrading programme has been in place for more than ten years with assistance from the Italian Government and the collaboration of the University of Bologna and an Italian NGO, AVSI. The settlement upgrading process demonstrated the role of external partners especially on issues regarding the technical aspects (software and hardware) and the promotion of public participation to an unprecedented level. Civil society is also considered important – more for monitoring government than for actively determining what is done, or partnering implementation. NGOs and CBOs are given importance as "alternative service providers," but with less emphasis on their capacity to determine what governments should do (Satterthwaite, 2005:109). For local organisations and municipalities to play an effective role in GIS supported upgrading programmes, political support is considered important. The upgrading programme in Belo Horizonte enjoyed political support from decision makers including the City Mayor, thus enabling it to achieve positive outcomes (Sahay and Borges, 2000).

The integration of GI tools within upgrading programmes is not without its limitations. Sahay and Walsham (1997) noted several issues which impeded the effective implementation of technology in developing countries. These are mainly related to and focused on institutional arrangements; sustainability; data management and manpower related issues. Within developing countries, many GIS projects are introduced as a package by international development agencies. Upon programme finalisation, financial support ceases and that leads to the end of the project. This has resulted in few projects which are fully established and sustainable. Similarly, many programmes relied on foreign experts who departed soon after project completion. Again this leads to the stalling of GIS programmes as little or no attempt is made to develop local support mechanisms (Sahay and Borges, 2000). According to Turkstra *et al.*, (2003) many GI supported projects were initiated, with most of them as stand-alones and lacking continuity due to reduced funding. They were not embedded in stable institutions, and in some cases were politically misused.

## **2.7 Theoretical Framework**

This section presents a theoretical basis with respect to stakeholders' participation in the upgrading process, including communities and the improvement of living conditions within

informal settlements. It is important to note that no single theoretical framework addresses these three elements.

### **2.7.1 Planning paradigms and upgrading processes**

#### *Top-down and Bottom-up Planning Approaches*

Emphasis is laid on the key steps taken by stakeholders to achieve desired goals in the upgrading process. Against a backdrop of the challenges facing informal settlements, most interventions are aimed at solving these issues in a bid to improve living conditions within the settlements. The theoretical framework starts by outlining the genesis of the various planning approaches.

Prior to the 1980s, planning took a top-down approach, which placed emphasis on central government control in decision making. Early proponents of the top-down approach included Pressman and Wildavsky (1973); with later modifications provided by Sabatier and Mazmanian (1979). This approach started with policy directions, often by central government, and proceeded to examine to what extent the actions of implementers and target groups were consistent with the prescribed policy. It further sought to understand how policy objectives were attained over time and their related impacts. This approach left little room for the place of target groups in contributing towards decision making or shaping the course of action within interventions.

Despite strengths associated within this approach, some criticisms and flaws were observed. MacIntyre (1985) observed that the ambitious criterion for policy to be clear and consistent was not practical in the contemporary world. Many policies incorporate a multitude of conflicting objectives. The approach (as indicated earlier) did not provide room for actors to participate fully in decision-making processes. Lowry (1985) pointed out that the focus was on the perspective of programme proponents, thereby neglecting the strategies (and learning) of other actors. These criticisms paved the way for new approaches (bottom-up) which provided for more inclusive and grounded planning.

The bottom-up approach as advanced by Hanf, Hjern and Porter (1978) took cognisance of the elaborate network of actors involved in service delivery, as well as their goals, strategies, activities and contacts. They placed emphasis on the flow of ideas from street-

level bureaucrats (the 'bottom') up to the 'top' policy makers in both the public and private sectors.

### *Planning Paradigms*

The rational comprehensive approach is seen as the basis for most other contemporary planning approaches. It is characterised by four main elements or steps (1) goal-setting, (2) identification of policy alternatives, (3) evaluation of means against ends, and (4) implementation of policy (Hudson (1979). The planning process usually seeks to follow a sequence of steps which are characterised by multiple interactions (**figure 2.4**). One of the key principles guiding this approach is that besides policy makers agreeing on goals and ends, these should be clearly stated and separated from alternatives.

According to Faludi (1973:140), a rational choice is made in the following manner; a) the listing of opportunities for action by the decision maker, b) identification of consequences that follow from the adoption of each possible action, c) selection of the action which would be followed by the preferred set of consequences. In Faludi's opinion, it would be impossible for a planner or decision maker to evaluate all actions open to them or even have the knowledge and resources to do so. A rational decision would therefore be one taken by the decision maker given the time and other resources available to him (ibid: 140). With reference to plan making, Faludi observed that the process was best described in five steps namely, analysis of the situation, end reduction and elaboration, design of courses of action, and finally the evaluation of consequences.

Faludi observed that any community resolving an issue regardless of its nature must go through decision making process steps in order to reach a decision and undertake action.

**Figure 2.4** outlines the steps and characteristics defining them.

<p style="text-align: center;"><b>Process Step I. Structuring and Defining Ideas as Proposals</b></p> <ul style="list-style-type: none"> <li>• <i>Recognition of discrepancy between desirable and current conditions</i></li> <li>• <i>Identification of the case as potentially actionable</i></li> </ul>
<p style="text-align: center;"><b>Process Step II. Identifying the Properties of Alternatives</b></p> <ul style="list-style-type: none"> <li>• <i>Merits of alternative solution as identified by experts</i></li> <li>• <i>Anticipated effect on the resources of the individual actors and the collectivity</i></li> <li>• <i>Presumed availability of social support for alternative courses of action</i></li> </ul>
<p style="text-align: center;"><b>Process Step III. Structuring the Decision Field</b></p> <ul style="list-style-type: none"> <li>• <i>Identification of potential support and opposition</i></li> <li>• <i>Initial negotiation</i></li> <li>• <i>Planning strategy for decision making</i></li> <li>• <i>Organising personnel and their resources</i></li> </ul>
<p style="text-align: center;"><b>Process Step IV. Engaging in Decision-making</b></p> <ul style="list-style-type: none"> <li>• <i>Acknowledgement of commitment and responsibility</i></li> <li>• <i>Involvement of relevant audiences</i></li> <li>• <i>Final negotiation</i></li> </ul>
<p style="text-align: center;"><b>Process Step V. Carry out the Consequences of Decision Process</b></p> <ul style="list-style-type: none"> <li>• <i>Implementation by designated persons or organisations</i></li> <li>• <i>Appraisal of actors and power relations</i></li> <li>• <i>Appraisal of action and consequences</i></li> <li>• <i>Regeneration of process steps (if necessary as a result of appraisals)</i></li> </ul>

**Figure 2-4 Rational Comprehensive Approaches Decision Process Steps** Source: Faludi 1973: 377

Alexander (2000:247) viewed planning as a “four-fold way”, which integrated different complementary paradigms, namely: rational planning, communicative practice, coordinative planning, and "frame-setting". The rational planning paradigm is regarded as a deliberate activity, aimed at problem solving, which involves self-interested individuals, or homogeneous social units (organizations, agencies, governments) (Alexander,



2000:247). In this approach the actor decides on the ends of future action and what appropriate actions to take.

Communicative practice on the other hand views planning as a social interactive process. This paradigm presents planning as an activity that follows the course of people's interactions and networking characteristics. According to Healey (1996), communication between the actors is this paradigm's focus and the subject of positive analysis and normative prescription. There is recognition of the central role of planners in interactive approaches ranging from facilitation to conflict resolution, mediation, and bargaining (Forester, 1999; Healey, 1993).

Coordinative planning regards planning as not only about where to go, but how to get there (Alexander, 2000). The primary focus is not on individuals but organisations that are mandated with planning to accomplish mutually agreed upon outcomes.

Frame-setting is oriented towards the social process of defining a problem situation and developing appropriate responses (Schon and Rein, 1994). The approach has multiple uses, ranging from developing community strategic plans to the maintenance or transformation of national planning doctrine (Alexander, 2000). Frame-setting provides for the interpretation and expression of ideas, reflecting their structuring power, through a process of policy discourse (Faludi, 1996; Hajer, 1995). According to Faludi (1996) the focus is on the community or planning community involved with a specific territory.

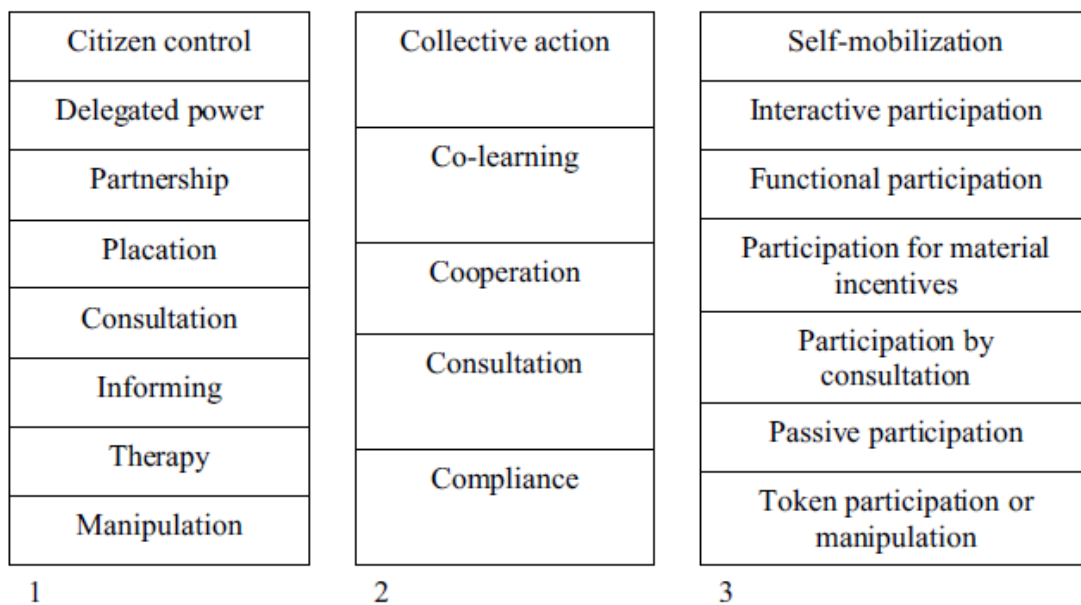
### **2.7.2 Participation elements of GIS-supported settlement upgrading**

Participation in planning discourses is often discussed in association with the involvement of communities in the planning and implementation of, for example, neighbourhood design, urban upgrading and renewal. The main focus of this concept is the active participation by grassroots communities in developing partnerships with other stakeholders, such as government, non-governmental organisations and development partners. The community in this regard is viewed as the end user and therefore deserves more control of what is happening within their settings (Hamdi, 1995). With regard to participation and empowerment Hardoy and Satterthwaite (1989:139) argued that: *“No local government is likely to respond effectively to the diverse needs of poorer groups unless there are effective channels for citizens to influence government policies and*

*priorities*". In the upgrading of settlements, participatory approaches were the successors to the controversial demolition approaches adopted by governments in a bid to get rid of informal settlements within urban areas.

Numerous definitions of the concept exist but in its broadest sense, participation is defined as "[...] a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them"; and its goal as "to reach and engage primary stakeholders [marginalized poor people] in ways that were transformational [...]" (Nelson and Wright, 1995:5). According to Nelson and Wright, the ideological bases of these concepts were derived from theories about "how society is organised and how it can be changed": society signifying 'stake holders' and 'change' signifying 'transformational'.

It is generally agreed that participation has a number of levels, which are often expressed in terms of 'ladders' – climbing from the least participatory to the most participatory (IAP, 2006; Innes and Booher, 2004; Choguill, 1996; Arnstein, 1969) ( **figure 2.5**, Chambers' collection of ladders).



1) Arnstein, (1969:217); 2) Adapted from Kanji & Greenwood, (2001:5), 3) adapted from Vaneklasen and Miller, (2002:88))

**Figure 2-5 Participation Ladders: Types and Depth of Participation**

Source: Chambers, 2006:105

McCall (2003) offered a different spectrum for effective participation, with facilitation at one end, empowerment at the other, and mediation and collaboration somewhere in the middle. Schlossberg and Shuford (2005) theorized about how the way that different public groups intersect with different types of participatory processes poses different requirements for technological support, including GIS. According to Schlossberg and Shuford, understanding the domain in which the participation takes place is essential for the credibility, efficacy, and theoretical foundation of such participation. They developed a meta-domain matrix of public and participation. From simple to complex, their matrix was constructed through a flow of domains: inform, educate, consult, define issues, joint planning, consensus, partnership, and citizen control (Jankowski, 2009, p 1968). According to Gramberger (2001), 'informing' implied providing stakeholders with information to assist them in understanding the challenges facing them. 'Consulting' in this case refers to the ability to obtain feedback on analysis and decisions. 'Involving' is expressed as working directly with stakeholders in the process of addressing issues to ensure their concerns are understood. 'Empowering communities' refers to an outcome where final decisions lie with the respective community.

### **2.7.3 Participation, empowerment and Geo-Information technologies**

A variety of methodologies for facilitating participation have emerged to promote equitable development. According to Chambers (1994), participatory mapping is one such popular tool for spatial data collection. The term participatory mapping, as it is used here, is defined broadly as any combination of participation-based methods for eliciting and recording spatial data. Specific examples include sketch mapping, scale mapping, and transect walking, among others. Similarly, planning approaches are changing focus to embrace more participation by concerned communities. This has led to the emergence of new planning and research approaches of Participatory GIS (PGIS) and Public Participation GIS (PPGIS). With the changing nature of development, the increasing emphasis on social and environmental sustainability, and the global attention to community-level planning, GIS is moving beyond conventional representations of where people live, to describe more effectively the dynamics of how people live (Vajjhala, 2005).

Corbett and Keller (2005) observed that the application of PGIS could empower disadvantaged groups by enabling them to use the language and tools of decision-

makers, thereby influencing events that affect their lives and local geography. The underlying justification for advancing the PGIS approach was based on the assumption that GI technology could provide a critical complement to grassroots efforts that are undertaken to empower communities (Kyem, 2004). The potential and advantages associated with GIS applications did not necessarily have to be enjoyed by power brokers but could be harnessed by the more marginal sectors of society and could serve to empower them (Harris and Weiner, 1998). Additionally, the tools, if used properly can help people make better decisions by enabling improved communication, design and analysis (Kingston, 2002; Al- Kodmany, 2000).

PGIS is strongly associated with the concept of community mapping. This is a participatory map-making process that involves collection of information about a community's area of jurisdiction and makes it visible to outsiders by using the language of cartography (Alcorn, 2001; Carter, 1996; Poole, 1995). The outputs of community mapping can be a medium of empowerment, through allowing communities to represent themselves spatially, using their own maps to seek recognition and inclusion in land and natural resource planning and management (Kyem, 2002 ; Weiner and Harris, 2002). The process of making community maps has also been identified as an empowering activity that serves to empower a community (McCall and Rambaldi, 2004; Flavelle, 2002; Aberley, 1993).

Although GI tools are seen as powerful tools for empowering communities, at the same time they are thought to have the potential to marginalize other people and organizations (Harris, 1998). The technology-empowerment-marginalization nexus is most evident in what has come to be known as Public Participatory GIS. It was at the Initiative 19 specialist meeting in Minnesota that the use of GIS for community empowerment and the democratization of spatial decision-making came to the fore (Harris, 1996). During the meeting it was further observed that GIS contributed to the social and spatial marginalization of communities via differential access to data and the political economy of information; the geo-demographic and surveillant capabilities of GIS; and through the digital representation, epistemologies, and multiple realities of landscape represented in GIS (Harris, 1998).

Although in practice GIS tools can act to both empower and marginalize communities simultaneously, it is important to note that these processes are context-specific. Providing communities with greater access to data about their own areas can simultaneously

increase their capability for greater surveillance over neighbours. Likewise, empowering groups through GIS technology can also simultaneously dis-empower historical leaders of that community who are uncomfortable with computer technology (Harris, 1998).

#### **2.7.4 Addressing challenges within GIS-supported settlement upgrading**

One of the key motivations for upgrading settlements is improvement of the environment. Upgrading aims at ameliorating the impact of poor environmental conditions on residents and the impact of settlements on the environment as well. Improving basic infrastructure contributes towards improving the quality of life of residents, and brings about important socio-attitudinal changes, improving the image of areas and integrating them into the social and political economy (Gulyani and Bassett, 2007; Barret and Beardmor, 2000). The role played by GIS in collecting and analysing data on living conditions within settlements is recognised. Moore (2002) and Martinez *et al.*, (2008) propose the development of an urban indicator approach in order to understand and address the poor environmental conditions within informal settlements. Besides collecting and analysing data, tools can be used to help monitor inequalities, target deprived areas, set priorities, and reallocate resources (Joshi *et al.*, 2002). Advances in spatial information technology and the diffusion of urban indicators present unique opportunities to better monitor living conditions in cities and explain the effects on the population and in particular on the urban poor (Martinez *et al.*, 2008:87).

Theoretically the role and impact of technology, in this case GI tools in upgrading processes, can be explained using technological determinism. It is recognised that technology has power as a crucial agent of change. Smith and Marx (1994:2) for example maintained that “*technology was a key governing force in society*”. The belief in technology as a key force is expressed through the view that new technologies and automation exert greater influence on society and its processes than other factors. Technological determinism claims that technology causes or determines the rest of society and culture (Dusek, 2006:84). According to technological determinism, society is bound to change as technology advances. The integration of GI tools in upgrading processes has revolutionarised the approach towards addressing the challenges that face informal settlements. Stakeholders are able to quantify and present spatial models of particular settings where they are working towards improving living conditions. Introducing tools like satellite imagery and global positioning systems (GPS) enables planners and communities alike to obtain near real-time accurate data, pertaining to the settlements

where upgrading programmes are planned. These tools provide stakeholders with better information which they can use to address existing challenges within the settlements.

Bimber in Smith and Marx (1994:80) presents three faces of technological determinism: normative interpretation, nomological interpretation and unintended-consequences. Normative interpretation is concerned with how norms of technological practice are independent of political and ethical values. The nomological interpretation views technology as the cause of social practice. The third interpretation is the unintended consequences, which state that the effects of technology cannot be foreseen. According to Bimber, the nomological interpretation is both technological and deterministic.

## **2.8 Reflection**

### **2.8.1 Implications for research**

The integration of GI tools as demonstrated earlier is associated with changes in the way participation and addressing challenges within upgrading processes are approached. The integration of these tools provides members of the community the opportunity of participating in enumeration and data collection activities and later using the analysed data and information to support their decisions. Using GIS platforms, stakeholders were able to visualise existing challenges and were therefore in a better position to address mainly the lack of infrastructure and insecure tenure as demonstrated by Abbott, 2003; Joshi, 2002; and Hasan, 2006 in case settlements in Africa and Asia.

The research therefore will explore how the integration of GI tools in upgrading settlements in the Kenyan context has an impact on the elements of participation and addressing challenges. Additionally the research will explore possible ethical issues revolving around issues of ownership of data, use of information including privacy and how best to address them. These lessons will be used to propose a framework for integrating GI tools to support future interventions aimed at improving the conditions within settlements of the urban poor.

## **2.8.2 Emerging issues and research gaps**

### *Planning and upgrading approaches*

Contemporary planning and upgrading approaches place emphasis on the bottom-up paradigm, which provides for active participation by stakeholders, including communities. The change of outlook towards informal settlements by national governments, especially within developing countries, opens new doors for the integration of informal settlements and resident communities as part of the city fabric. This has provided decision-makers, communities and planners with opportunities to address the issues facing informal settlements. The integration of GI tools in upgrading processes is seen in the light of providing stakeholders with better information for decision making.

### *Participation, empowerment and technology*

Community-based upgrading approaches provide a more inclusive, collaborative style of project planning and implementation. Community-based approaches provide for a high level of citizen mobilization and involvement in decision making that is an essential ingredient for the successful planning and upgrading of settlements. In processes where GI tools are integrated, stakeholders, especially communities, have been provided with better information regarding their settings. Settlement mapping activities, which entail mapping of social and physical attributes within settlements, enable communities to understand their settings and therefore put them in a better position to contribute towards decision-making. The application of participatory GI systems can lead to the empowerment of disadvantaged groups by enabling them to use the language of decision makers. In summary, GI tools provide a critical complement to grassroots efforts that are undertaken to empower communities (Corbett and Keller, 2005; Kyem, 2004).

## **2.8.3 Research gaps**

There exist numerous studies on the integration of GI tools within Latin American and Asian contexts. Compared to Africa, and specifically the Sub Saharan context, Latin America and Asia have well-developed settlement upgrading programmes. This may be explained by the relatively stronger economic status these continents enjoy. However, from the African continent, there are few studies focusing on GI tools within upgrading

processes. This study will help address this shortcoming, as well as providing recommendations for further research (Chapter 9).

The potential role of GI tools in upgrading processes is recognised. The tools, as has been demonstrated earlier, offer the potential to provide stakeholders with better information for decision-making. Research on how these tools may help governments, and indeed communities, meet Millennium Development Goals is limited, especially within an African context where many cities are faced with the challenge of informal settlements.

Although the discourse on GI for planning informal settlements focuses on broad thematic issues like participation and governance, evidence on the impact of integrating these tools is yet to be fully understood. The impact of GIS-supported upgrading processes on vulnerable persons such as single female-headed households and young people are yet to be understood in Kenya and other countries with similar settlements. There remains a gap in the literature on social transformation associated with the integration of GI tools in the upgrading process. The physical transformation of settlements may be evident, but the less obvious or hidden social impacts are equally important.

## **2.9 Conceptual Framework**

The conceptual framework presented (**figure 2.6**) shows the key elements related to upgrading processes for GIS-supported settlements. It is composed of two unique but interrelated parts, namely technical and political processes. The interaction of actors, policies and tools (including data) in upgrading processes defines the technical part of upgrading. This process leads to outputs such as spatial models of the settlement, which in turn are used by actors to support decision-making processes, which are viewed as political processes within the research. An overlap between the technical and political processes in upgrading is appreciated within the framework presented.



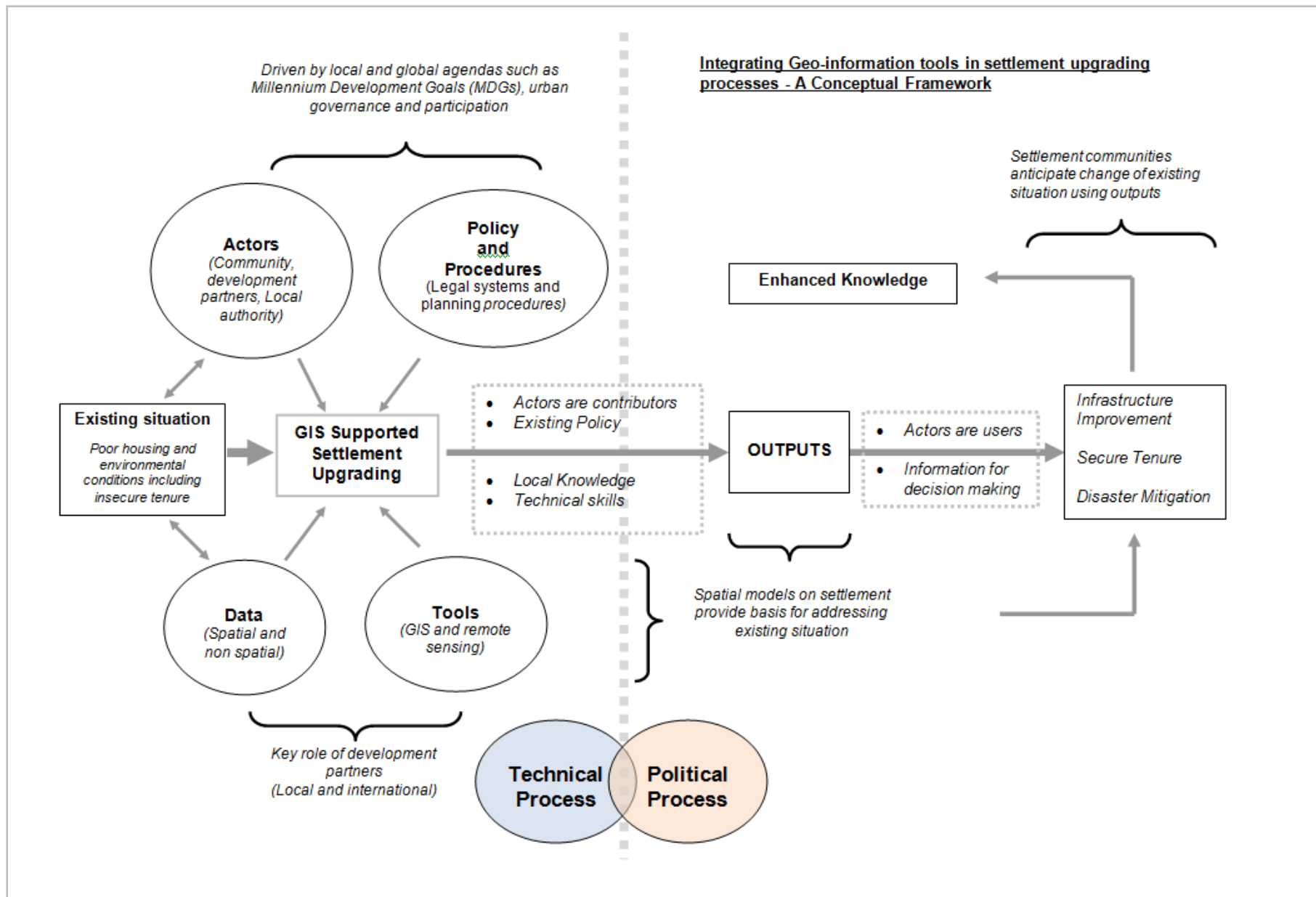


Figure 2-6 Conceptual Framework

### **The existing situation:**

Communities living in informal settlements form the poorest segment of the urban population within Africa, Asia or Latin America and are faced with the same set of interrelated problems, such as limited or no access to clean water and sanitation, and in some cases, a lack of security of tenure (Durand-Lasserve, 2006).

Informal settlements are central to meeting the Millennium Development Goals targets. The Millennium Declaration by the United Nations in September 2000 set a target under the Millennium Development Goals, calling for the improvement of the lives of at least 100 million informal settlement dwellers by 2020. Improving living conditions within slums will result in better health and ensure communities living within these settlements are fully integrated into the urban economy. This justifies why local governments and international development partners have an interest in addressing the challenges of informal settlements.

#### *Addressing the situation (actors, policy and tools)*

The approaches taken within the different countries to improve settlement conditions are aimed at improving access to basic physical and social infrastructure, as well as to economic opportunities, and ensuring secure tenure. The interventions are largely attributed to policy changes within governments and at the global level, which seek the active involvement of all stakeholders, including settlement communities. Communities are expected to contribute part of their own resources (time and finance) towards planning, implementation, development, operation and maintenance of infrastructure.

In South Africa development partners and local authorities, in partnership with communities, developed a method-based approach to informal settlement upgrading that could be used as a replicable model for other countries. The method had a GIS interface which was used to develop a spatial data management system. A key objective of this upgrading methodology was to empower the community, both through the provision of detailed community information and then by the use of that information to support negotiations with the local authority (Abbott, 2003:576).

The use of GI technologies for informal settlement upgrading and related urban planning activities is widely recognised (Hasan, 2006; Aksoylu, 2005; Glöckner et al., 2004; Sliuzas, 2004; Ceccato and Snickars, 2000). The starting point is the recognition that

large-scale, replicable upgrading of informal settlements is only possible through the use of spatial information technologies (Abbott, 2003). These tools enable stakeholders to work in a much more interactive way to address the multi-faceted nature of informal settlements.

Key actors within slum upgrading processes include: the communities, local authorities and development partners (NGOs and Community based organisations - CBOs). Their role has been crucial, for example, in the provision of technical expertise and spatial data, all essential components of a successful GIS operation.

The lack of accurate data on existing situations justifies the use of GIS tools within upgrading processes. In India for example, one of the main obstacles to effective urban planning is a lack of up-to-date, comprehensive and sufficiently detailed information about urban areas. This lack of information is a major reason behind the failure of urban municipalities to include informal settlements in city-wide planning and urban development (Bishop *et al.*, 2002; Joshi, 2002).

Mason *et al.*, (1997) observe that the practicality of using Informal Settlements GIS (ISGIS) is dependent upon five principal factors:

- (1) The promise of high technology geo-spatial data collection systems to yield low-cost data which displays adequate currency;
- (2) The degree to which community level information-gathering proves to be viable;
- (3) The ability to integrate collected data into low-cost, easy-to-use GIS databases suitable for supporting decision-making at the community level;
- (4) The awareness of interested role players in the potential of the technology and education in its use; and
- (5) The willingness of the role players to participate and support ISGIS, for example with capacity for its maintenance.

#### *From data to information for decision making*

The collection of spatial and attribute data using community surveys or enumeration, aerial photography or satellite imagery, yields raw data defining settlement characteristics. A GIS platform is used to analyse spatial and non spatial data sets and provide information and visual models regarding the existing situation. The models obtained after GIS analysis provide useful information in the form of indicators about the situation or

existing challenges. These indicators provide planners and decision-makers with information for decision making around issues related to improving the living conditions or infrastructure status within a settlement. The type of data to be collected and analysed is determined by the objective of the project or intervention strategy. This process may be driven by development partners or communities themselves, in order to gain a better understanding of their environment. The information generated may also be used as a tool for bargaining with local authorities, thereby empowering communities.

In the long run it will be necessary for stakeholders to have confidence that GIS is producing credible outputs and answers to queries and calls for analysis. Credible answers depend on four essential factors:

- I. The integrity of users,
- II. The skill of users,
- III. The integrity of the underlying data and the models used,
- IV. The compatibility between the different data sources that are being integrated into a single GIS analysis (O'Looney, 2000).

Some of the data gathered and analysed within a GIS environment to generate indicators of a settlement is shown in **figure 2.7**. These indicators will form a basis for decision-making as they provide accurate details and statistics. The scenarios developed correspond to the challenges facing the community and the objectives of the intervention programme.

Urban managers, communities and their development partners need better information about the existing settlement situation in order to develop interventions or allocate resources to areas of most need and greatest impact. The use of GIS tools for settlement mapping enables the participation of all stakeholders interested in improving the living conditions within settlements. A GIS, in essence, helps to define problems in new ways and thus provide visual outputs to aid interventions.

The impact of this technology is contingent on, and shaped by, complex social and political relationships that constitute the power of different knowledge systems, decision-making processes, actors, and institutions which are the focus of critical GIS research (Elwood, 2002:50). The question is not so much whether GIS is empowering or

disempowering, but in what ways does it foster empowerment and disempowerment, and for whom?

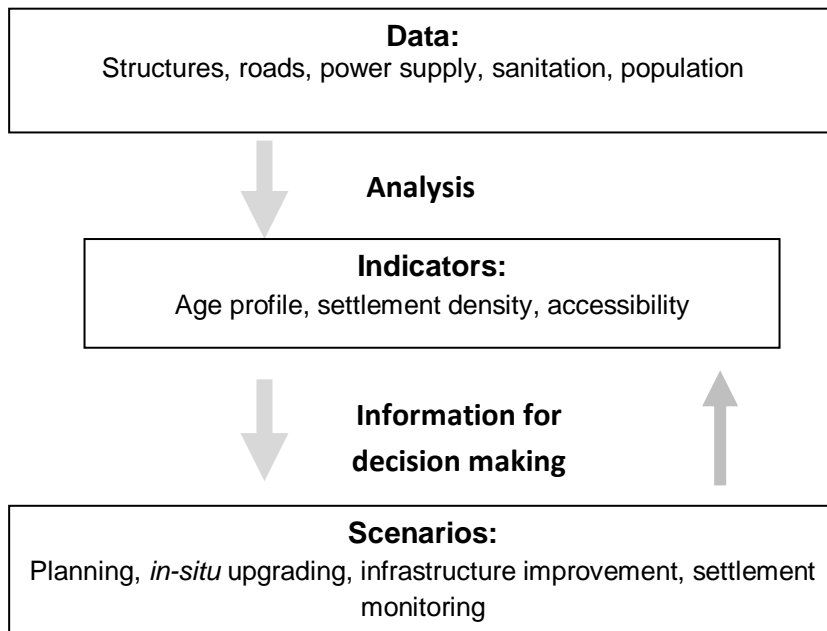


Figure 2-7 Data and Decision making Linkage

What is the basis of this empowerment or disempowerment for different actors and institutions? In developing answers to these questions, much of the literature does not offer an explicit explanation of what may constitute empowerment or disempowerment in these contexts. This presents an opportunity for the research to add empirical and conceptual depth to critical GIS research regarding what kinds of changes can be interpreted as empowering or disempowering, especially through the participation of communities in GIS-supported upgrading processes.

#### *The technical and political processes*

In the initial stages, where key stakeholders use GI tools to collect data for upgrading purposes, the process is more technical. Planning policy and procedures support the use of technology through the actors. Using a GIS-based platform, outputs, some of which are spatial in nature, are generated and used by actors to support decision-making processes. However, the later part of upgrading has considerable political features, as it involves decision making towards addressing existing challenges within settlements

## 2.10 A Framework of Investigation

The literature and associated theories reviewed pave the way for this research to explore three further main aspects associated with the integration of GI tools in settlement upgrading. These are:

1. How Geo-Information tools were integrated to support the upgrading process,
2. Participation by and roles of various stakeholders including communities in relation to GIS use, and
3. How GI tools have been used to address existing challenges within the settlements.

An understanding of how GI tools were used to support the upgrading process will enable the research to develop a basis for exploring participation and the impact of the tools. The process outlines who participates and what roles they perform. Similarly examining the process will provide answers to policy on the best option/approach to follow with regard to upgrading. It is important to note that the socio-economic landscape defining settlements is dynamic and therefore no single approach may offer a comprehensive solution. The attempt in this case is to provide a guiding framework which can be modified to suit prevailing conditions.

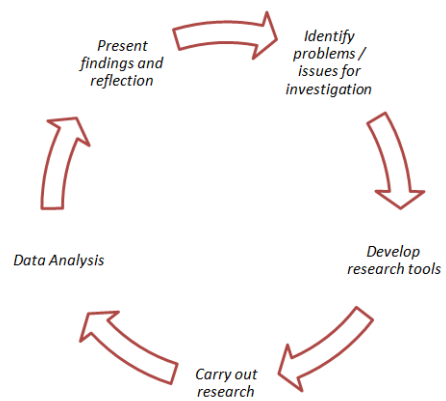
Participation as mentioned earlier can empower communities living within the settlement and can be seen as a positive development. However, the empowerment of formerly marginalised groups may destabilise existing power structures held in place by information availability and social status. The research will explore how the integration of GI tools empowered communities as well as dis-empowered previously powerful groups or individuals. Information or the lack of it, and consequent impacts on power structure will be explored within the research. There exists an explicit link between power and information (Alcorn, 2001; Abbott *et al.*, 1998; Chambers, 1994) where those in control of information ultimately control the decision-making process. Central to the above notion is who controls the process and information gathered using GI tools. The role played by external actors, from international to local organisations, within the upgrading process will be critically evaluated. These organisations play important roles such as providing technical support and capacity building. It however remains to be seen whether this position influences the way communities participate in decision-making processes.

The study will explore how GI tools have been used to address existing challenges within the settlements. The lack of accurate information has been blamed for the inability of

stakeholders, especially governments, to address issues within settlements (Satterthwaite, 2003b). The lack of up-to-date information showing the location of settlements was blamed for the failure to integrate settlements within larger city plans for improving infrastructure in India and Pakistan (Hasan *et al.*, 2005; Joshi *et al.*, 2002). This research will go further to explore social transformations associated with the integration of the tools. This evidence will enhance the justification for considering social impacts in intervention policies aimed at improving settlements.

Ethical implications of integrating tools will be explored within the major themes of the research. There are concerns, for example, in cases where communities are involved in data collection with regard to whose agenda they are driven by. Questions arise as to whether they are motivated by the agenda of development agencies or the larger community agenda. Regarding mapping and information availability, the research will seek to find out if too much information about a community can be harmful. GI tools have enabled stakeholders to unmask settlements and challenges therein previously unknown to them and the communities living in them. However, the level of data that can be made available regarding a setting is debatable.

The following chapter presents the research design and methodology. It details the steps taken to collect information to support further investigation of the key elements defining the study. The methods chapter also presents a reflexive account of the study, and the position of the researcher.



# Chapter 3

## Research Design and Methodology



## **Chapter 3: Research design and Methodology**

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### 3.1 Introduction

Upgrading in most cases is implemented in the form of projects to improve the condition of informal settlements. Upgrading approaches often include predetermined principles and objectives. Consequently, studies of upgrading projects are usually done in the form of evaluations, focusing on whether the project has achieved its predetermined objectives. Such evaluations consider the communities and their settings, where which the intervention is taking place, to be passive. But in reality, informal settlements present dynamic socio-economic environments with multiple actors.

In Chapter five, upgrading is viewed as a process rather than a project. Based on this understanding, the method used in analysing the integration of GI tools in the upgrading process was inspired by the “participatory GIS approach”, as advanced by a number of authors (Chambers, 2006; Elwood and Ghose, 2004; McCall and Rambaldi, 2004; Chambers, 1994). This approach supports the empowerment of both urban and rural communities through integrated applications of geo-spatial technologies to address existing challenges, which involves a set of continuous process of transformation within communities. Providing communities with necessary information from the onset triggers a series of actions with notable community input. The ultimate result is an empowered community able to contribute tangibly towards improving their settings.

This study, aiming to explore the integration of Geo-Information in upgrading processes, was conducted within informal settlements in Nairobi, Kenya. The key actors in these upgrading schemes include: resident communities, government and development partners (including non-governmental and community based organisations), whose main objective is to improve on the poor environmental conditions existing in these settlements.

The primary goals of upgrading projects are to provide secure land tenure in informal and often illegal areas, and to improve basic infrastructure and service delivery (Gulyani and Bassett, 2007; Hasan et al., 2005) with the active participation of communities (Acioly, 2009; Imperato and Ruster, 2003). In view of the above, the central focus of the study is to explore how the integration of GI tools in upgrading projects has contributed to enhanced participation by communities and helped in the improvement of the environment.

A systematic and elaborate research design and appropriate methodology was applied to the data collection, analysis and presentation of findings. A well-elaborated research methodology ensures that the evidence and data obtained can enable the study to answer the research questions as unambiguously as possible (Vaus, 2001: 9). On the other hand, the choice of an appropriate research design is dependent upon the nature of the objectives and questions the study seeks to achieve and answer (**figure 3.1; operationalizing the research design**). Moreover, the link between research design and research questions/objectives is well documented (Yin, 2003 ; David, 2001; Hakim, 2000). The key research components (research questions, methodology goals/objectives, conceptual framework and validation) and their linkages are explored in subsequent sections in the chapter.

### 3.2 The Research Design

Global concerns regarding challenges facing informal settlements form the background to this study. In effect, the research aims to explore whether the integration of GI tools provides a platform for all inclusive participation and whether it provides a better approach towards addressing issues/challenges and thereby leading to the improvement of the environment.

The conceptual framework presented in Chapter 2 shows the importance of these tools in helping communities as well as development partners obtain better information regarding settlements and existing conditions. Through the use of the tools, stakeholders are able to obtain spatial models highlighting key issues within the settlement. This information is important for decision-making and the fact that communities are involved in generating it, makes the process inclusive and transparent.

A mixed method approach was used to collect data. Mixed methods were chosen because pure quantitative or qualitative data collection techniques have limitations, and the mixed method to some extent offers a solution to this, capitalising on the strong aspects of each to counter inherent weaknesses (Saunders, 2007). A multiple case design was used in this research. The advantage of using multiple case designs, as pointed out by Yin (1994:45), is the fact that they are more compelling and are considered more robust than single case designs. Yin further points out that multiple case studies are

considered when a comparative study among cases is envisaged. However, Yin cautions that research involving multiple cases may demand more time and resources to be manageable. In this study data was collected from three settlements, using tools such as focus group discussions, key informant interviews, secondary literature review, observation and mapping.

An across-case analysis approach was used to present information on the three study themes. These themes form the basis of the main analysis chapters (5, 6 and 7). The cross-case analysis was designed to establish patterns and variations and their implications for policy, theoretical and methodological landscapes and conclusions, which are discussed in Chapters 8 and 9 (**figure 3.1: Research Design and Process**). Hendrick *et al.*, (1993) observed that:

*selecting a research design is a key decision for research planning, for the design serves as the architectural blueprint of a research project. It ensures that the data collection and analysis activities are tied adequately to the research questions and that the complete agenda will be addressed. (Hedrick et al., 1993:38).*

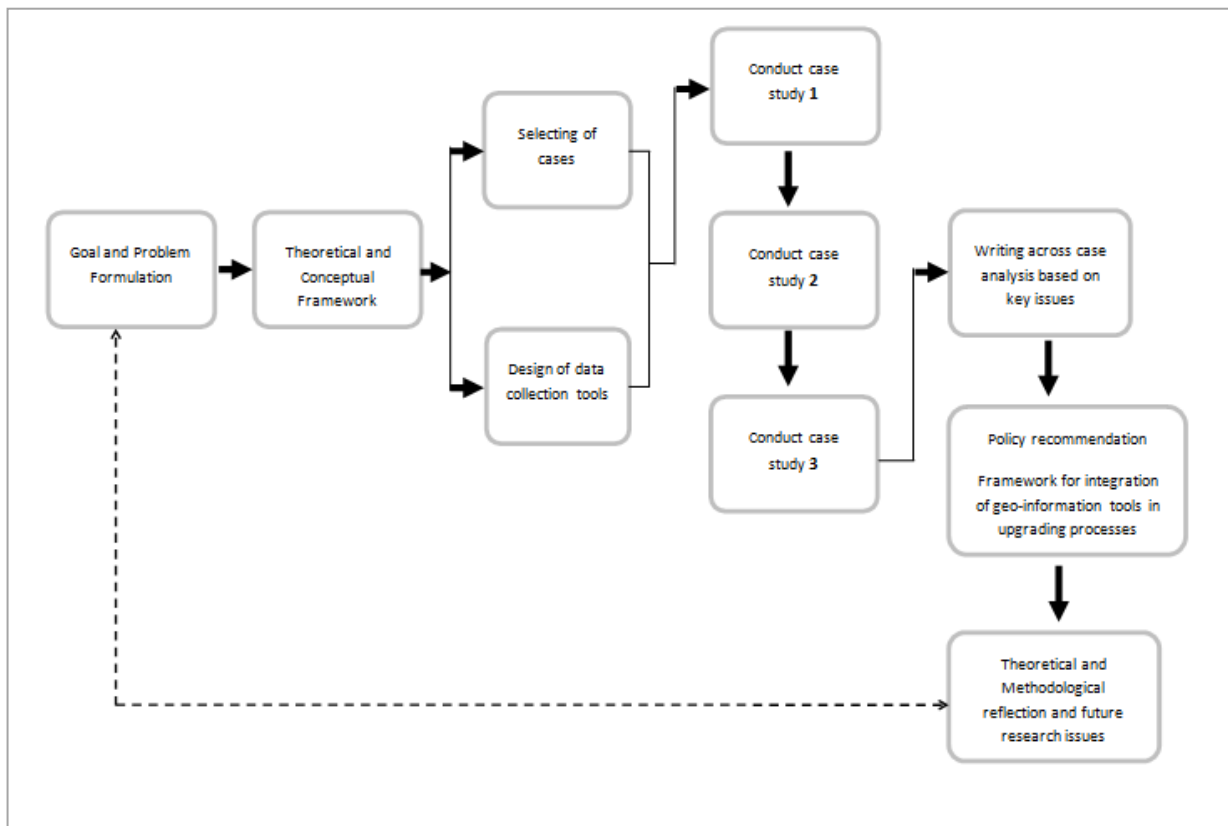


Figure 3-1 Research Design and Process

## Operationalizing the Research Design

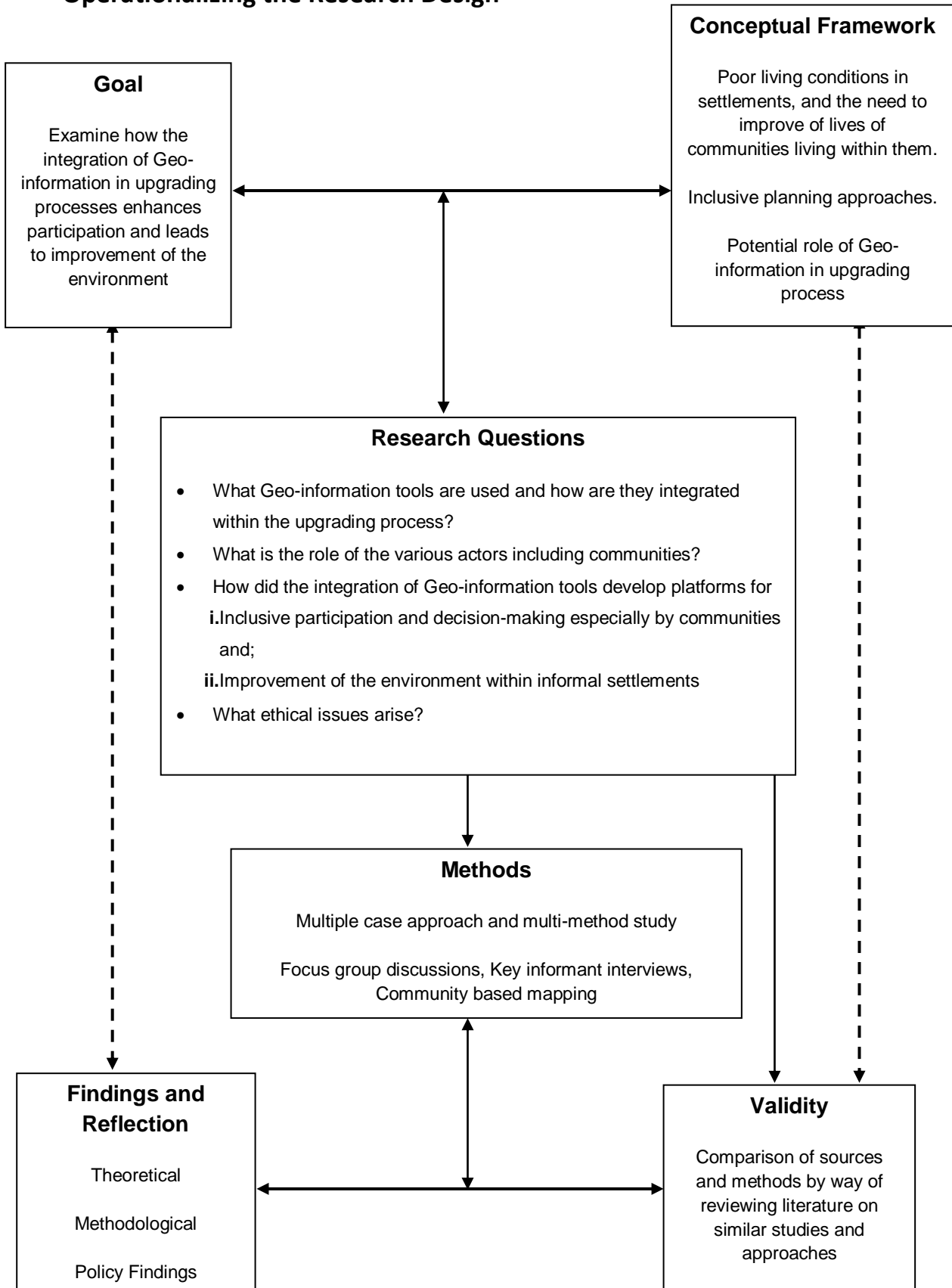


Figure 3-2 Operationalizing the Research Design

### 3.3 Setting the Research Agenda: An Epistemological Position

GIS tools are regarded as important because they are capable of providing decision makers with information derived from the integration of data from spatial and non spatial sources. According to Elwood (2006:93), the tools are a “*powerful mediator of spatial knowledge, social and political power, and intellectual practice in geography*”. Discourses regarding Geo-Information and related spatial tools are concerned primarily with their use or application aspects, limitations and potentials, and the social and technical contexts. Additionally, epistemological concerns also focus on the potential social and political implications of limitations and capabilities of the tools in different contexts (Global North and South).

Elwood (2006:700), points out that some of the emergent participatory GIS and community-mapping initiatives and processes may not be as attentive to issues of access, power relations, and diverse knowledge claims, such as the critiques of GIS that fostered participatory GIS in the first place. Participatory GIS research has as one of its central goals increasing the power of grassroots groups and marginalized social groups in social and spatial decision making, and enhancing their efforts to improve their social and physical environments. This justifies the need to investigate the nature of inclusive and participatory practices in GI-supported processes. Elwood further suggests that research should explore what forms of knowledge are promoted, and which are excluded. As these mapping initiatives are promoted by both public and private institutions, there is a need to examine to what extent local knowledge is appreciated and how communities are engaged with decision-making processes.

Critics such as Obermeyer (1998) and Sheppard (1995), however, pointed to the exclusion of people and places represented by this knowledge. They saw GI technologies as promoting positivist epistemologies. Similarly, as apprehended by Pool (1983), rather than being a “*technology of freedom*”, these tools further marginalised the disadvantaged, such as the urban poor who were not able to participate fully in the benefits of the spatial information revolution.

On the other hand, there have been approaches which concentrate on altering the research, planning, and decision-making processes in which Geo-Information is used, to try to make the tools inclusive of a greater diversity of people and enhance participation

especially by marginalised sections of the community by way of collaborative decision making (Kyem, 2004; Craig *et al.*, 2002; Sieber, 2000). Other process-oriented GIS practices have developed strategies for ameliorating some of the access barriers experienced by grassroots groups and resource-poor or marginalized groups (Elwood, 2006).

The discourses presented regarding the access, empowerment and impact these tools have on the communities and environments they are applied to, propel the need to explore the use and application of GI tools within urban upgrading processes. In addition, it is important to understand the context within which GIS tools are applied in the upgrading process. The impact of GIS and related technologies depends on the political, social and economic context in which they are embedded (Harris and Weiner, 1998). This study therefore explores the existing planning and legal framework under which upgrading takes place.

To obtain a clear understanding of the dynamics of applying the GI tools within settings with social and technical implications, the study adopted an interpretivist approach. Owing to the technology orientation of GI tools, a positivist approach is applied in aspects such as spatial data analysis as presented in chapter 7. Data and information were gathered to understand how GI tools impact on society, the environment and the processes therein. The interpretivist approach used in this research aims to understand human behaviour such as actions taken by communities to participate within or use GI tools in upgrading processes. The study examines three case settings each with unique character and different sets of stakeholders. An interpretivist approach is justified given that there is likely to be a different experience within these case entities across time and space.

### **3.3.1 The research approach**

The interpretivist approach as observed relates to the research addresses questions about what is happening and what is likely to happen in future. The approach used here is more descriptive, as opposed to being grounded in statistical or mathematical logic. According to Walsham (1993:4-5), interpretivist studies attempt to understand phenomena through the meanings that people assign to them. In this research, the approach is applied to understanding the context of integrating GI tools into upgrading processes and ultimately how these tools influence, and are influenced by the settings.

The approach is used to explore two unique and interrelated elements, namely GI tools (mainly seen as positivist) and community and actor roles in upgrading (seen as advocacy / participatory discourses). The research uses an interpretivist lens to explore how GI tools enhanced the stakeholders' participation and helped them to address challenges within the settlements. This was done by way of empirical observation, measurement and querying.

The use of participatory methods to obtain data and information from communities and key informants, gives the research a participatory and advocacy angle. The integration of GI tools in settlement upgrading processes is expected to empower communities, since they provide information that would otherwise not be available.

The research can be seen to have a strong pragmatic dimension. It focuses on real world practices in cases where GI tools are applied. The research problem is of significance to the country and region where the case studies take place because it attempts to examine the impact of GIS tools in upgrading processes. Kenya, like many other countries in the Sub-Saharan Africa context, is faced with issues of growing informal settlements. The research is expected to develop a model of GI tools integration within upgrading programmes which will result in change within the current planning approaches if implemented.

### **3.4 The Setting– the Cases and Participants**

#### **3.4.1 The general setting**

The research was conducted within selected informal settlements in Nairobi, Kenya. The settlements are characterised by a dense set-up of small shelters built from temporary materials such as mud and wattle, many of which are overcrowded and lack access to clean water and adequate sanitation.

The City of Nairobi alone has more than 150 informal settlements (Pamoja-Trust, 2009) with an estimated population of 1,300,000, which represents 40% of the city's population, occupying less than 10% of the total land area (**figure 3.3**). In line with national and international goals the government and development partners including non-governmental organisations have embarked on upgrading programmes aimed at improving the lives of



the urban poor. Different approaches have been used with regard to the upgrading of informal settlements. These range from small-scale to large-scale interventions, applying *in situ* upgrading or comprehensive upgrading.

The role of government and non-governmental organisations is observed, with the latter more engaged in upgrading programmes in many of the settlements. The Government of Kenya is, however, undertaking the largest upgrading programmes in the Kibera and Korogocho settlements, which involve a comprehensive approach with secure tenure and housing being provided to the resident communities.

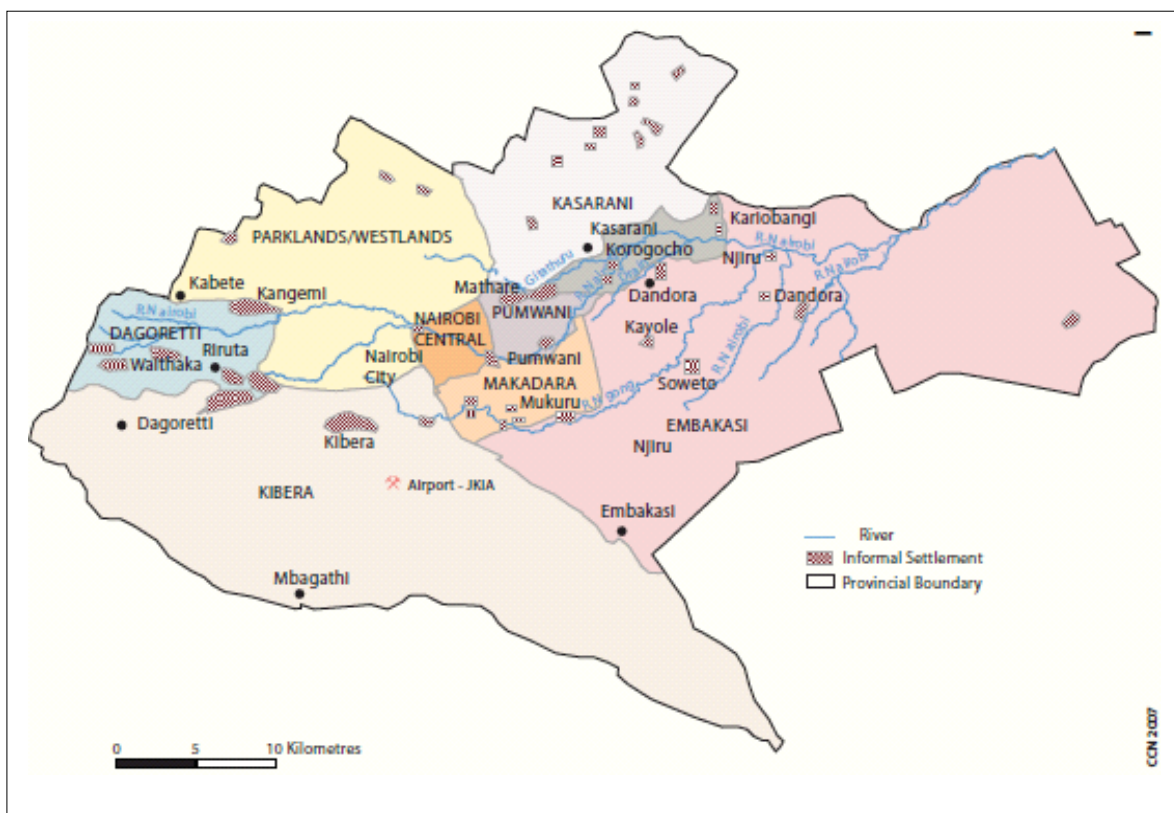


Figure 3-3 Location of Informal Settlements, Nairobi City

Source: UNEP, 2009

The three cases selected for this study are the Mukuru, Mahira and Korogocho settlements. These settlements represent the spectrum of informal settlements in Nairobi where upgrading activities are taking place, as well as being examples of the application of GI tools as an integral aspect within the upgrading process. It is important to observe that not all settlement upgrades integrated GI tools within their set-up. Settlements where

GI tools have been used within upgrading processes in the City of Nairobi include: Kibera, Mukuru, Huruma, Mathare and Korogocho. GI tools have also been applied in upgrading programmes outside Nairobi, in the municipalities of Kisumu, Embu, Mombasa and Nakuru. Table 3.1 illustrates settlements where GI tools have been integrated in upgrading processes.

**Table 3-1 Settlement Upgrading with Integration of Geo-Information Tools in Nairobi**

<b>Settlement</b>	<b>Upgrading Activity</b>	<b>Initiator</b>	<b>Application of GI tools</b>
Kibera	Secure tenure and infrastructure improvement	Government of Kenya and UN-Habitat	Mapping and enumeration of existing population and infrastructure facilities
Mathare	Secure tenure and improved access to infrastructure	the Pamoja Trust	Mapping and enumeration of existing population and infrastructure facilities
Korogocho	Secure tenure and infrastructure improvement	Government of Kenya and UN-Habitat	Mapping and enumeration of existing population and infrastructure facilities
Korogocho	Improving environmental health	Goal-Kenya (NGO)	Mapping of infrastructure facilities such as water, sanitation and drains
Mukuru	Improving environmental health	Goal-Kenya (NGO)	Mapping of infrastructure facilities such as water, sanitation and drains
Mahira	Secure tenure and improved access to infrastructure	the Pamoja Trust (NGO)	Mapping and enumeration of existing population and infrastructure facilities
Kiambiu	Settlement profile and sector analysis for water and sanitation improvement	Maji na Ufanisi	Mapping of infrastructure facilities, such as water, sanitation and drains

The three cases identified for detailed analysis were selected to represent large-scale (Korogocho) and small-scale upgrading programmes (Mukuru and Mahira), in which GI tools were integrated. The Korogocho settlement upgrading was an initiative of the Government of Kenya and UN-Habitat. This is a settlement-wide programme, targeting all villages within Korogocho. This is similar to the Kibera upgrading programme, in having both Government and international development partners are involved. The small-scale upgrading programmes in Mukuru and Mahira were supported by Goal Kenya and the Pamoja Trust respectively.

### 3.4.2 The specific cases

The criteria used to select the cases included the scale of upgrading (small or large), the upgrading approach (*in situ* or comprehensive) and the key actor involved (NGO or Government).

Mahira and Mukuru were selected to represent small-scale upgrading projects supported by NGOs (the Pamoja Trust and Goal Kenya respectively), of which the former adopted a comprehensive upgrading approach. Korogocho represents a large-scale upgrading case, where the government is the key initiator. Programmes supported by the government are usually large scale and adopt a comprehensive upgrading approach. These require large capital outlays and are therefore carried out by Government or international development agencies. NGOs were involved in small-scale upgrading programmes, mainly implementing *in situ* upgrading approaches.

Table 3-2 Selection Criteria for Case Studies

Case/Settlement		Case Mahira Settlement 1	Case Korogocho Settlement 2	Case Mukuru Settlement 3
Criteria				
Scale	Small			
	Large			
Approach/Scope	<i>In situ</i>			
	Comprehensive			
Key Actor	NGOs			
	Government			

### 3.4.3 Key issues, the actors, data sources and collection techniques

The key purpose of collecting data was to understand the following key issues: firstly, the upgrading process and integration of GI tools; secondly, the participation and roles of stakeholders identified, including communities; thirdly, how GI tools were applied to address existing environmental challenges within the settlements; and finally, ethical issues arising in the process of integrating the tools. Understanding the upgrading process made it possible to develop a broad picture regarding the stages of upgrading and how GI was integrated, by whom and for what purpose.

#### *Actors*

The study relied on various actors to obtain relevant information regarding how the integration of GI tools impacted on upgrading processes. Each of these actors played a specific role in upgrading and therefore had varied experiences to share. The key actors included:

- a) **The Community:** in the three cases examined, community members who had prior experience in the upgrading process were identified and invited for the focus group discussion sessions. To obtain diverse views and opinions, the research participants were selected to cut across gender and age categories. Young members were identified and included in the groups for interview. Some of the community members chosen served in settlement committees while others were representatives from interested community organisations. Using first-hand experiences, these community members were able to provide information regarding impact and shortcomings noted as a result of applying the GI tools within the upgrading process.
- b) **Non-government actors, including international organisations:** this group included local and international development organisations as well as community-based organisations. The organisations played key roles such as provision of spatial data, technology and the know-how to process and analyse the data collected for upgrading purposes. Some of the organisations were involved in capacity building activities, such as aiding communities in spatial data collection using GPS tools and aerial photography interpretation. Some of the organisations that were visited for the study included UN-Habitat, the Pamoja Trust and Goal Kenya.
- c) **Central and local government officials:** these were mainly officials from government departments involved in upgrading processes who were also using GI tools in the

process. Officials from the Physical Planning Department of the Ministry of Lands and Urban Development Department, from the Ministry of Local Government, were interviewed to obtain information regarding their roles and use of GI tools in upgrading programmes.

d) Key informants: These included researchers mainly from academia and other organisations involved in urban planning within Kenya and internationally. These experts provided a broad comparative analysis based on experiences from the region and outside Africa. A list of the key informants consulted during the field work is provided in Appendix E.

**Table 3-3 Summary of Actors and the Information they provided**

<b>Source</b>	<b>Information</b>
<b>Government Sources</b> Ministry of Lands and Settlement Ministry of Housing	Contribution to the upgrading process, impact of GIS and limitations, policy towards settlement upgrading, policy gaps with regard to the use of GIS tools in urban planning
<b>Local Authorities</b> Nairobi City Council	Role in upgrading and level of GIS usage, appropriateness of tools to upgrading, limitations within local authorities regarding use of GIS tools, legal and institutional aspects to enable integration of GIS tools.
<b>Non-Government Organisation sources</b> Goal Kenya The Pamoja Trust	Contribution to upgrading process, community participation and empowerment issues, impact of GIS and its limitations, policy and gaps towards settlement upgrading, with regard to the use of GIS tools in urban planning.
<b>Academia</b> University of Nairobi	Upgrading processes and the potential use of GIS tools, policy environment and integration aspects.
<b>International Organisations</b> UN-Habitat Kenya Italian Debt Programme	Integration of GIS tools in upgrading programmes.  Potential of GIS tool use, and policy gaps that countries need to address.
<b>Community</b> Selected settlements	Role played, impacts observed with regard to participation and improving the environment.

### **3.5 Data Collection Methods**

A mixed approach to collecting qualitative and quantitative data was preferred over stand-alone approaches. This according to Johnson and Onwuegbuzie (2004) is ideal, given the complexity of research environments facing social science researchers. Case-study and mapping methodologies were used to provide an in-depth picture of the integration of GI tools in upgrading processes. Methods for the collection of qualitative data included interviews, focus group discussions, and observation, based on what is suggested by Yin (1994:80). A GIS platform was used to process and present data collected by the community. Quantitative analysis works within the positivist tradition and is more oriented towards numerical analysis. Qualitative data and analysis, according to Lincoln and Guba (2000), on the other hand, works within the constructivist tradition and is more concerned with the analysis of narrative/descriptive data.

The use of multiple methods in this study made possible the triangulation and validation of information from primary and secondary sources. Triangulation increases the reliability of the data and the process of gathering it (Yin, 2003 ; Creswell and Miller, 2000). The findings were compared in two ways. First, data from key informant and individual interviews was compared with that obtained from the focus group discussions and secondary sources. Second, findings from focus group discussions were shared with key informants, including international experts, for verification and clarification. It is important to note that within the cases observed, international development organisations played a key role, especially in providing spatial data and tools for analysis. The data collection methods are described with respect to the key issues investigated in the field study: upgrading processes and GI tools integration, participation by actors and how the tools were used to address existing challenges within the settlements.

#### **3.5.1 Analysing the upgrading process and integration of GI tools**

Emphasis was laid on the key steps involved in the upgrading process and its aftermath, and examining how, when and which tools were integrated in the upgrading process. The primary methods used for collecting the information were key informant interviews, focus group discussions and secondary sources. These multiple methods offer flexible and exhaustive lines of inquiry, while approaching different actors in the process. According to Yin (1994), interviews give the interviewees an opportunity to express their opinion, and

allow the researcher to use follow-up questions to deepen an understanding of the subject. Key informant interviews sought the opinions of several experts who had a role to play in the upgrading programmes. These included officials from governmental and non-governmental organisations (Appendix E).

The focus group discussions involved members of the community and officials from the supporting development partners. Refer to Appendix A for issues explored. In these sessions, participants offered their observations on the upgrading process and how GI tools were used in it. In addition, they provided firsthand accounts of using the GI tools and challenges they encountered. The sessions were comprised of 6 to 8 participants drawn from the settlements, taking into account gender and age balance.

Secondary data was obtained from government officials and departments as well as from the NGOs involved in upgrading. This data included project reports, background literature, government documents, maps and existing research reports. Process mapping tools were used to present the key stages of upgrading and use of GI tools.

### **3.5.2 Analysing participation by actors**

The second key issue that was explored in the field study was the participation and role played by the major actors. After exploring the key processes and steps taken during the upgrading, it became apparent that there were multiple actors involved each with specific roles.

The focus group discussions and key informant interviews focused on the roles played by the various actors with respect to integration of GI tools in upgrading, how the process enhanced community knowledge, how the integration of GI tools affected the relationship between different actors involved in the upgrading process, and what barriers hindered communities from fully participating in upgrading processes supported by GI tools (see Appendix E for list of meetings and interviews). It was considered especially important to ask women and youth members from the communities about their role and participation perceptions, because traditionally their inclusion in planning and decision-making forums was not taken into account. Despite an increasing focus on youth and women in urban planning and decision-making processes, they continue to remain outside of the process in many settings. Women and youth and particularly those from urban poor settings are

often isolated, disempowered, and marginalized in community planning processes (Dennis, 2006; Moser *et al.*, 1993).

### **3.5.3 Assessing how tools were used to address environmental challenges**

A key objective of the upgrading programmes was to improve existing living conditions within informal settlements. During the field study, it was evident that the process and steps followed in the upgrading were intended to address challenges facing the settlements. Again the focus of the interviews and meetings with the actors explored what issues were addressed and how GI tools supported the process.

In the three cases examined, both the communities and organisations were either in the process, or had already carried out the main upgrading activities for which GI tools were used. In Mahira and Mukuru settlements, the processes had been concluded, therefore the field study focused on understanding what had transpired. In Korogocho, the upgrading process was ongoing, which offered a good opportunity to examine firsthand the actors' application of the tools. All three of the selected cases had been undergoing upgrading activities less than two years prior to the commencement of the field work. The participants therefore had a good recall of the events and activities that took place.

### **3.5.4 Community-based mapping: assembling the blocks**

The research was also interested in determining to what extent communities were capable of using GI tools for upgrading, planning and decision making. To explore this, members from Korogocho were identified to carry out the task of spatial and attribute data collection. This approach is comparable with community-based participatory research or collaborative and centred research. These approaches are all committed to conducting research that shares power with, and engages, community partners in the process, both for their own benefit and to establish findings that can be translated into interventions and policy changes (Israel *et al.*, 2005).

Part of this research was to collect data (both spatial and attribute data) which could be used to develop models to support decision-making processes. The community based mapping activity was defined by a series of steps (Table 3.4). The process started with a formal meeting with the community leadership. Research and data collection activities with informal settlements require approval by the settlement leadership to verify the intentions of the activity and ensure the safety of the research team.



Table 3-4 Key Steps in Community Mapping Process

Step	Activity	Description
1	Negotiating community with	Formal authorisation and notification of settlement leaders about intended research, seeking their support for the research
2	Defining the survey items	Determining what aspects to collect data on. The data to be collected reflects what needs are to be addressed.
3	Recruiting and training the researchers	The research team was drawn from the settlements and included those who were familiar with the settings and households involved. A gender balance was maintained in the data collection team.
4	Conducting the survey	A checklist was used to collect data from households. The team was led by a settlement leader. Around 100 households from the Kisumu Ndogo settlement were involved.
5	Verification of data	The team and researcher went through the data to identify gaps or errors in the recording.
6	Using the data for analysis and developing models	Data used to develop models and generate information which could be used for decision-making and policy.
7	Informing policy and decision-making organs	The researcher provides feedback to stakeholders.

### 3.6 Data Analysis and Presentation

In the initial stages, the large volume of data collected posed some difficulties. However several procedures were used to manage the data and contribute useful insights. Initially the data was assembled into different arrays, based on the cases and thematic issues to be further explored. Other approaches used included creating data displays — flowcharts and other graphics—for examining the data, tabulating the frequency of different variables and putting information in chronological order. Miles and Huberman (1994), for example, advocate the use of some of the aforementioned approaches to manage large and complex datasets associated with case studies involving multiple cases and qualitative and quantitative data sources.

In Chapters 5, 6 and 7 the key issues of the upgrading process and the integration of GI tools within it, stakeholder participation, and addressing environmental challenges, are discussed. The discussion follows an across-cases approach and incorporates the perceptions and views from the interviews with communities and key informants. The data from the cases was analysed separately (within-case analysis) and compared with other

cases (between-case analysis) to identify commonalities or distinctions. According to Yin (1994:33) this can be understood as a form of 'pattern-matching' and 'explanation-building' analytical technique. This procedure consists of data examination, categorization and tabulation of information in order to achieve comprehensive analysis. Additionally, cross-case and within-case examination techniques were used along-side existing literature and supportive theories to ensure external validity.

To obtain a better understanding of the key issues, the research had to rely on present and past upgrading activities in which GI tools were integrated. The research relied on first hand experiences and also secondary sources to build the case. Much of the data from the communities was retrospective data. This posed a problem, considering it was not always easy for the community members to recall the past. According to Henry *et al.*, (1994:92-93), retrospective data sources are considered to pose difficulties due to '*remembrance of the past*'; however, existing documents helped us to triangulate the retrospective data.

Qualitative data from interviews was extracted for analysis from tape-recordings, using transcription. Narrative analysis, including the use of verbatim quotations given within the study, was relied upon. These quotations were used as evidence, as explanation, and also expressly to give the participants a voice. Corden and Sainsbury (2005) pointed out that quotations could bring a report to life, and personalise the findings in a way that the researcher's narrative text did not. As observed by Kellett (2000), the importance of taking into account the voice and experience of urban poor communities themselves was necessary if change was to be effective. Reading the research participant's own words could deepen the readers' understanding of their situation and settings. Understandably, such experiences would be lost if research only relied upon positivist methodologies.

### **3.7 Checks and Balances: Ethical Considerations**

Geographic information technologies are often viewed as surveillance tools (Elwood, 2010; Pickles, 1995). The data they produce may be used to invade the privacy, and even the autonomy, of individuals and groups. With this in mind, I was aware that the communities concerned would raise issues regarding the use of information obtained during the field study. This was the case in Korogocho, where part of the data to be

collected included the structure-owners' details. This was important data for analysing the settlement model to reveal ownership details by gender. To safeguard the details of the structure owners, it was decided not to collect their names or identification.

Christians (2005:144-145) maintains that conventional social science research includes codes of ethics which are primarily based on four principles: informed consent; absence of deception; privacy and confidentiality; and accuracy. With regard to accessing and interacting with the community, official notification and permission was sought from settlement leaders before commencing field work activities. Informed consent was sought after formal introduction and provision of research details and other relevant information, including my identification. The community were particularly concerned about the reporting and presentation of the information they provided. To avoid inaccurate or distorted presentation, narratives by the community or key informants were presented using the original wordings, or accurate translations where narratives were in Swahili. The language used during discussions was Swahili, which is a commonly understood language. I was able to translate the discussions and present them in the thesis in a manner depicting the participants' distinctive voices.

Data gathered and presented using geographic technologies are used to make policy decisions. Erroneous, inadequately documented, or inappropriate data can have grave consequences for individuals and the environment. Data collected in Korogocho was verified by the community before being used to develop models in Chapter 7. As Christians (2005:145) puts it, "deliberate misrepresentation is unacceptable", although it is not simple to eliminate it, and even within controlled laboratory experiments, misrepresentation may occur.

Regarding confidentiality and anonymity, the research places importance on the fact that people have the right not to have their identities or the organisations to which they belong revealed. Although this may be the desired intention, it is often not possible, especially in situations where due to the uniqueness of certain issues and interventions (like GIS usage in projects), other external actors may easily make reasonable guesses of the identity of the individual or organisation.

The research ensured that no individual(s) would become a subject of research unless they had been given prior notice and an invitation to participate, especially in focus group

discussions. Similarly no pressure or inducement of any kind was applied to encourage an individual to take part in this research.

## **3.8 Reflections**

### **3.8.1 Limitations of the field study**

Several limitations regarding the study were experienced during the course of the fieldwork. These included: selection of participants and their representativeness, resource limitations, opportunities to conduct settlement mapping exercises, and suspicion by members of the community.

During the focus group discussions, only a select number of participants were identified. For the purpose of controlling and managing the sessions, the group size was limited to eight members. However, a deliberate effort was made to ensure a fair gender balance in the sessions. These participants may have had good knowledge on the upgrading activities, especially with regard to use of GI tools, but it should not be assumed that they represented the entire community within the settlements. In the case of Mahira and Korogocho, all the households in the settlements were enumerated and mapped during the course of the upgrading process. This implies that there were many other community members who were aware of the mapping activities and could have potentially contributed towards the study, but were left out. The same constraints applied to the inclusion of experts from government and non-governmental organisations. During the fieldwork, only a select number of officials from these organisations were contacted. The study therefore presents a section of inputs of all those involved in upgrading activities, more specifically those involved in using GI tools in upgrading processes (see Appendix E on list of persons contacted). Much as it is desirable to solicit views of all experts involved in upgrading programmes, it was not logistically possible during the time of field work.

I chose to conduct the research in settlements where I had not worked before. This was done to gain more experience and go beyond the cases I had previously participated in. In essence, I used these 'familiar' settlements as reference and control cases. In these new settings, I was initially treated with suspicion by members of the community/public, despite being in the company of officials from organisations working within the settlements. This had a bearing on the focus group meetings, since the participants took

time to settle and contribute freely. Communities within informal settlements are often suspicious of unfamiliar persons within their neighbourhoods.

Difficulties were experienced in trying to access settlement-related data from the Ministry of Local Government. Officials in-charge of the data claimed it was sensitive and could not be released to the public at that moment in time. Data sharing between the public and government departments is not common practice in Kenya. Although I had all the necessary documentation to prove the data was meant for research purposes, I was still refused access to the data set.

### **3.8.2 Positionality and reflexivity during fieldwork**

Greenbank (2003:789) maintains that the inclusion of reflexive accounts and the acknowledgement that academic research cannot be value-free should be included in all forms of research. An important aspect of qualitative research is to make sure that the methods utilised and procedures employed in the analysis reflect the nature of the research object rather than the methodological convictions of the researcher (Sarantakos, 1997: 188).

To avoid dominating and controlling the research process, I paid attention to the issue of reflexivity and positionality while undertaking research. This is an idea supported by Sultana (2007) who also points out that researchers need to factor in ethical concerns for every stage and aspect of the research process, from its conception to its conclusions. Additionally, she argues that if the investigator's reflexivity and positionality are added only at the end of the research, it amounts to mere surface dressing. Sultana (2007:376) further maintains that reflexivity in research involves reflection on self, process and representation, and critical examination of power relations and politics in the research process, as well as implying researcher accountability in data collection and interpretation.

My previous experience with the use of GI in settlement upgrading processes had a significant impact in the choice of the research topic and selected case study settings. I have had previous experiences with informal settlement upgrading processes involving the application of GI tools. Initial experiences occurred during my tenure as a civil-servant at the Ministry of Land and Settlement, Department of Physical Planning. I was involved in the mapping and enumeration of the Kibera informal settlement in Nairobi (with an estimated population of 400,000) between 2001 and 2003. Mapping was supported by the

use of aerial photographs and satellite images, while enumeration was carried out to develop attribute data pertaining to each structure identified on the ground. The experience gathered in this particular programme was used to support other non-government organisations such as the Pamoja Trust, Practical Action, and the Umande Trust in upgrading schemes across the country. My role in these latter cases was that of consultant. The networks I had developed over time with communities and organisations involved in upgrading contributed towards shaping this academic journey.

My acquired new role and status as a student conducting research within informal settlements of Nairobi posed initial challenges. My previous role and status was that of an urban planner and professional and therefore I was in a position to control most of the activities I participated in. My new status as a student researcher implied that I address and approach the communities researched and settings in a different manner. Although I participated in the focus group discussions, I did not push the participants to give answers but rather allowed them to provide insights freely. This approach enabled the participants to provide personal accounts independent of the influence of my socio-economic, educational and employment background (see Appendix F on a translated focus group discussion).

In addition, efforts were made to reduce power and subservience tendencies, leading to perceptions that could have negatively affected the relationship between myself and the researched. My status as a researcher from an overseas university could have created perceptions that I had a higher standing and therefore created communication and interaction barriers. However, to ease such feelings, I was accompanied by persons well known to the communities within the settlements. The focus group discussions were also attended by officials from organisations working within the communities, who had made a significant contribution towards improving living conditions in the informal settlements. Association with persons who were familiar with the settings and their inhabitants ensured that the fears of both the researcher and the researched were assured.

### **3.9 Conclusion**

This chapter has focused mainly on the approach and tools used during the field work phase. It has been evident that the study explores the impact of GI tools, which are generally associated with positivist approaches. Nevertheless, the research design adopted an interpretivist approach to examine the key issues.

The tools and approach were designed to explore how upgrading processes can integrate GI elements. The purpose was to understand how the application of GI tools provides platforms for inclusive participation at the same time as addressing existing challenges within the settlements. The tools used to obtain information enabled the research to obtain firsthand accounts on the integration of GI tools in upgrading processes from communities and key informants who were involved. This approach yielded rich data and information which has been used throughout the thesis to support the arguments made.

My previous experience with upgrading processes has played a major role in explaining the desire to explore this particular research topic. Previous activities around involving communities in mapping influenced my desire to contribute towards improving approaches to GI tools usage in settlement planning. However, I was aware of the possibility that my experiences might influence the findings or even drown the voices of those who contributed views during the discussions and interviews.

The following chapter will move on to discuss the landscape that defines informal settlements and the role played by GI tools in the upgrading processes.



## Chapter 4

Nairobi; Growth, Informal Settlements and Upgrading



## **Chapter 4: Nairobi; Growth, Informal Settlements and Upgrading Processes**

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## **4.1 Introduction**

This chapter presents an overview of urbanisation in Kenya, with a specific focus on Nairobi City, the capital of Kenya, which provides the setting for the case study settlements examined in the study. In this chapter, five main issues are discussed, namely: urban growth in Kenya, the planning framework, informal settlements and inherent challenges and finally the integration of GI tools in upgrading processes.

Analysis of the spatial and temporal aspects of Nairobi City's growth provides a clear picture of the evolution of informal settlements. The implications of informal settlements have led stakeholders, including communities, to develop upgrading programmes aimed at addressing existing challenges inherent in the settlements. Planning and upgrading approaches alike have adopted the use of tools like GI systems in order to gain a better understanding of the dynamics within informal settlements.

## **4.2 Urban Growth in Kenya – Before and After Independence**

The 21st century in Africa is characterized by a total population reaching one billion, with approximately 40%, or close to 400 million, living in urban areas. UN-Habitat (2010) projects that by 2050 the population in Africa is likely to be two billion, with 60% living in urban areas.

The rapid growth, especially of urban population, may not necessarily translate into problems but may rather represent potentials, for example, in terms of economic opportunities. Clearly if urban growth remains uncontrolled and unmanaged, then governments and people alike will be subjected to chaos and poor living standards, such as those depicted within the informal settlements in many cities of developing countries. In Nairobi City for example, more than 50% of the population occupies less than 10% of the city's total land area. The population within these settlements lives in overcrowded conditions, often lacking access to basic infrastructure.

### **4.2.1 Urban areas and informal settlements in Kenya**

The process of urbanization in Kenya is an evolving phenomenon, with high urban growth rates experienced after independence in 1962. At independence, only one Kenyan out of

every 12 (8%) lived in urban areas.<sup>7</sup> However, by the 1999 and 2009 population censuses, the proportion of the urban population had increased to 17% and 36% respectively, affirming that one out of every three Kenyans currently live in urban areas (GoK, (2010)). Moreover, this percentage is expected to increase to 50% by 2015, with urban areas expanding spatially and taking up more agricultural or rural land. It is also noteworthy that during the 1989-1999 inter-censal period, the number of urban centres rose from 139 to 194, representing a 40% increase (UN-HABITAT, 2007). The growth of urban areas in Kenya has been characterized by challenges which require concerted effort by key government, private sector and development partners. These include but are not limited to inadequate shelter, slum upgrading and tenure regularization in informal settlements, unemployment, delinquency, crime, unavailability of infrastructure (clean water, drainage and sanitation), lack of adequate public transport and environmental degradation and urban poverty.

A combination of socioeconomic reforms and high urban population growth rates has led to increased challenges within urban areas in Kenya. The Structural Adjustment Programmes (SAP) proposed by the World Bank and International Monetary Fund (IMF) led to decreased Government support for housing provision, even in the face of increasing demand and low supply, especially of low income housing. The result was a shortfall in housing supply, especially in urban populations, where demand exceeded supply. The acute shortage of urban housing and the problem of inadequate shelter have manifested themselves in the rapid formation and growth of informal settlements and tenement structures with characteristic deficiencies in the supply of the most basic infrastructure and public facilities (UN-HABITAT, 2007). Current estimates by the government and development partners indicate that more than half of Kenya's urban population live in slums and informal settlements, thus implying that over five million urban residents live in slums and informal settlements with deficient housing and infrastructure. The World Bank and Cities Alliance project that by 2020, urban poverty will represent almost half (48.9%) of the total poverty in the country (Kessides, 2006). Inevitably, urban poverty is closely linked with the process of rapid urbanization in the country, which means that it is likely to continue to increase as the country urbanises, unless sufficient measures are put in place (Oxfam-GB, 2009:3).

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<sup>7</sup> Urban areas were designated as market centres, towns, municipalities and cities, with a minimum population of 2000 people.

#### 4.2.2 Nairobi: a rapidly urbanizing city

Nairobi City owes its birth and growth to the Kenya Uganda Railway which reached Nairobi in May 1899. The moving of the railway headquarters from Mombasa to Nairobi resulted in the subsequent growth of Nairobi as a commercial and business hub for the then British East Africa protectorate (Situma, 1992:167).

Following its founding in 1902, the city had a population of approximately 100,000 people by 1945. By independence in 1963, it had reached around 350,000 people (Olima, 2001). Population trends for the City of Nairobi are presented in Table 4.1. While the annual rate of growth has at times exceeded 10%, it has more recently decreased to below 4% per annum, which is still high by global standards. Nairobi's projected population in 2015 is likely to be approximately 4 million. The footprint of the city's growth can be defined in at least two ways: first, the official boundary or area changes, and second, the actual changes in settlement (**figures 4.1 and 4.2**) (Mundia and Aniya, (2006).

**Table 4-1 Nairobi City Growth (Area and Population - 1906 to 2009)**

Year	Population of Nairobi	Increase in population %	Area (Km <sup>2</sup> )	Density (people Km <sup>2</sup> )	Kenya Total Population	Nairobi as % of Kenya Population
1906	11,512	-	18.13	635	n.a.	-
1928	29,864	159.4	25.37	1,177	n.a.	-
1936	49,600	3.5	25.37	1,955	n.a.	-
1944	108,900	119.6	25.37	4,292	n.a.	-
1962	343,500	124.2	684	390	8,636,263	3.1
1969	509,286	90.9	684	745	10,942,705	4.7
1979	827,775	62.5	684	1,210	15,327,000	5.4
1989	1,324,570	60.0	684	1,937	21,445,000	6.2
1999	2,143,254	38.1	696	3,079	28,686,607	7.5
2005	2,751,860	22.1	696	3,954	33,445,119	8.2
2009	3,138,369	12.3	696	4,509	38,610,097	8.1

*Compiled from Olima, 2001 and Government of Kenya, 2010*

Much of Nairobi's urban footprint is unplanned settlement, driven by factors such as rapid population growth and urban poverty and rural urban migration. Informal settlements date to the city's earliest days when the colonial government through the Swynnerton plan (1954) appropriated large tracts of land, displacing the local African population, with no provision for their resettlement. In the early 1990s, it was determined that over half of the city's population was living in unplanned settlements (UNEP, (2009).

**Figure 4.2** illustrates the boundary changes that took place from 1900 until 1963, after which they have remained the same. The population of the town has also changed significantly. Its main sources of growth have been immigration, especially from Central Province.

From this early growth, the city's functions have developed and expanded, such that today it has achieved an overwhelming dominance in the political, social, cultural and economic life of the people of Kenya and the whole of the Eastern Africa region (Mitullah, 2003).

### 4.3 A Spatial Temporal Analysis of Informal Settlement Growth

Between 1906 and 1963 the boundary of Nairobi City expanded from 77km<sup>2</sup> to the current area of 696 km<sup>2</sup> (**figure 4.2**). Boundary increments over time were carried out to accommodate the rapid growth of the urban centre, both in terms of the population and infrastructure (Mitullah, 2003).

Distinct spatial patterns of settlement emerged after independence, where race and income characteristics defined the landscape. The eastern suburbs of the city were dominated by low income groups, mainly of African origin, while the western suburbs were predominantly inhabited by Asians and Europeans. There was a stark contrast between the suburbs in terms of access to services. This position is reflected today not so much in terms of race, but rather in terms of incomes as well as population densities. The people living in the western suburbs are generally the more affluent while the lower and middle-income elements of society dominate the eastern suburbs. The spatial structure of Nairobi is thus based on land uses and income levels (Olima, 2001:6).

Table 4.2 illustrates the growth patterns exhibited by the low, middle and high income areas of Nairobi. The low income areas, which are mainly located to the east of the city, are the largest uncontrolled urban settlements in the city, with settlements like Korogocho reaching densities of 1,300 people per hectare in 2009. In comparison, the high income/low density areas of the city have less than 50 persons per hectare, some with as few as four to eight persons per hectare, as in the cases of high income neighbourhoods of Karen and Muthaiga respectively.

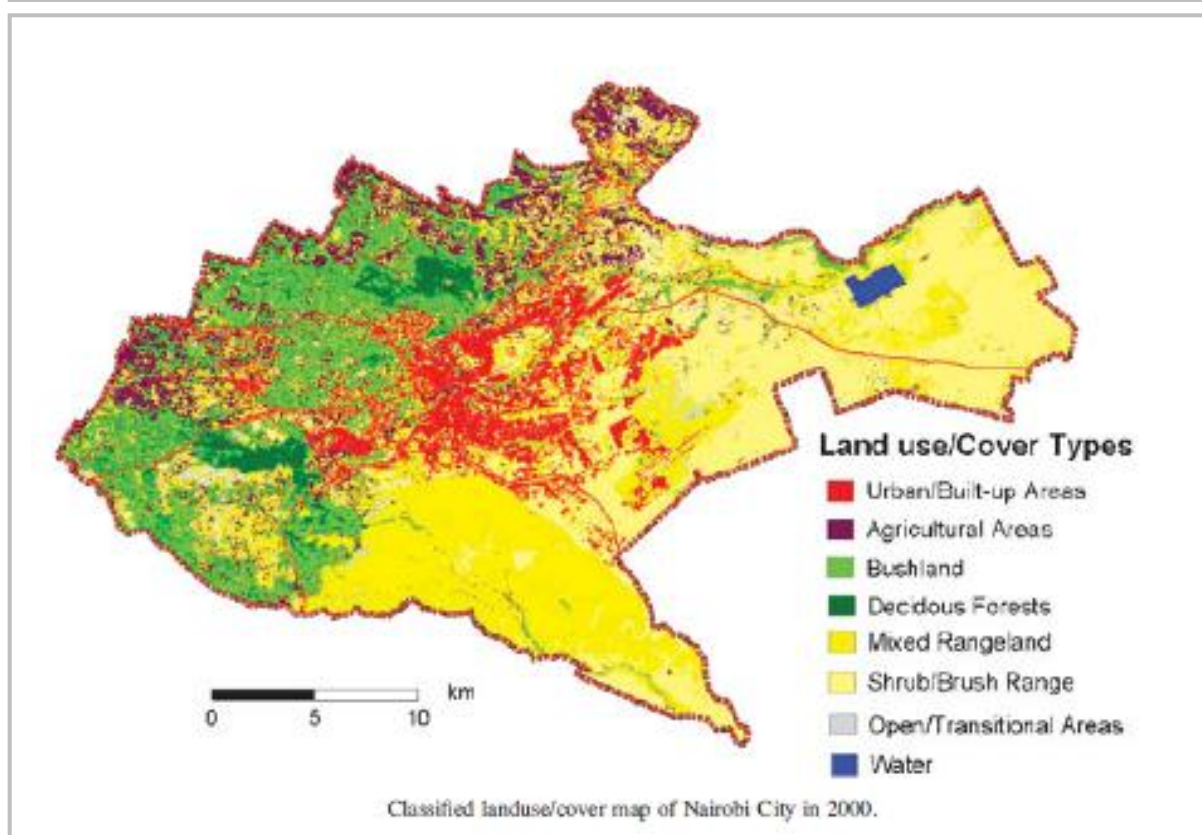
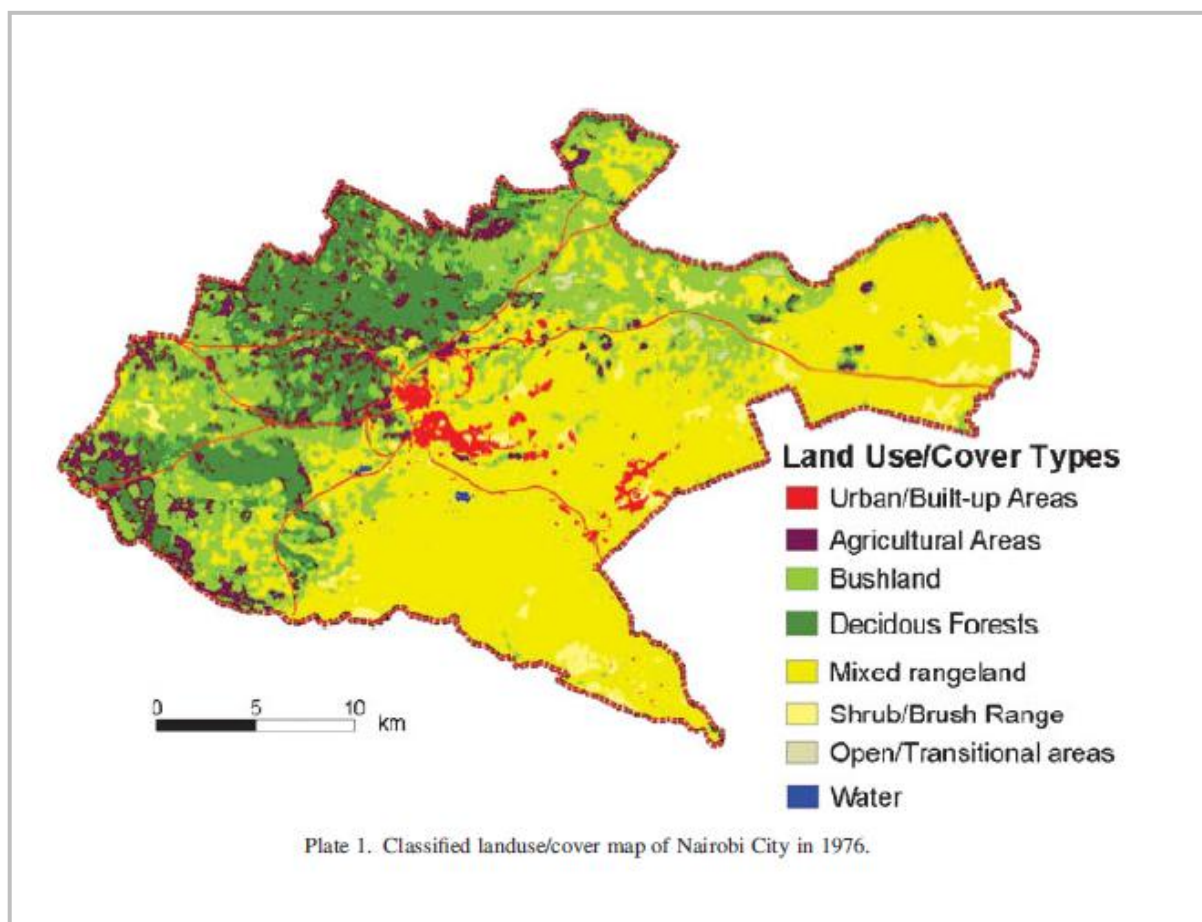


Figure 4-1 Nairobi Land Use/Cover Change (1976 - 2000) Source: Mundia and Aniya, 2006:105

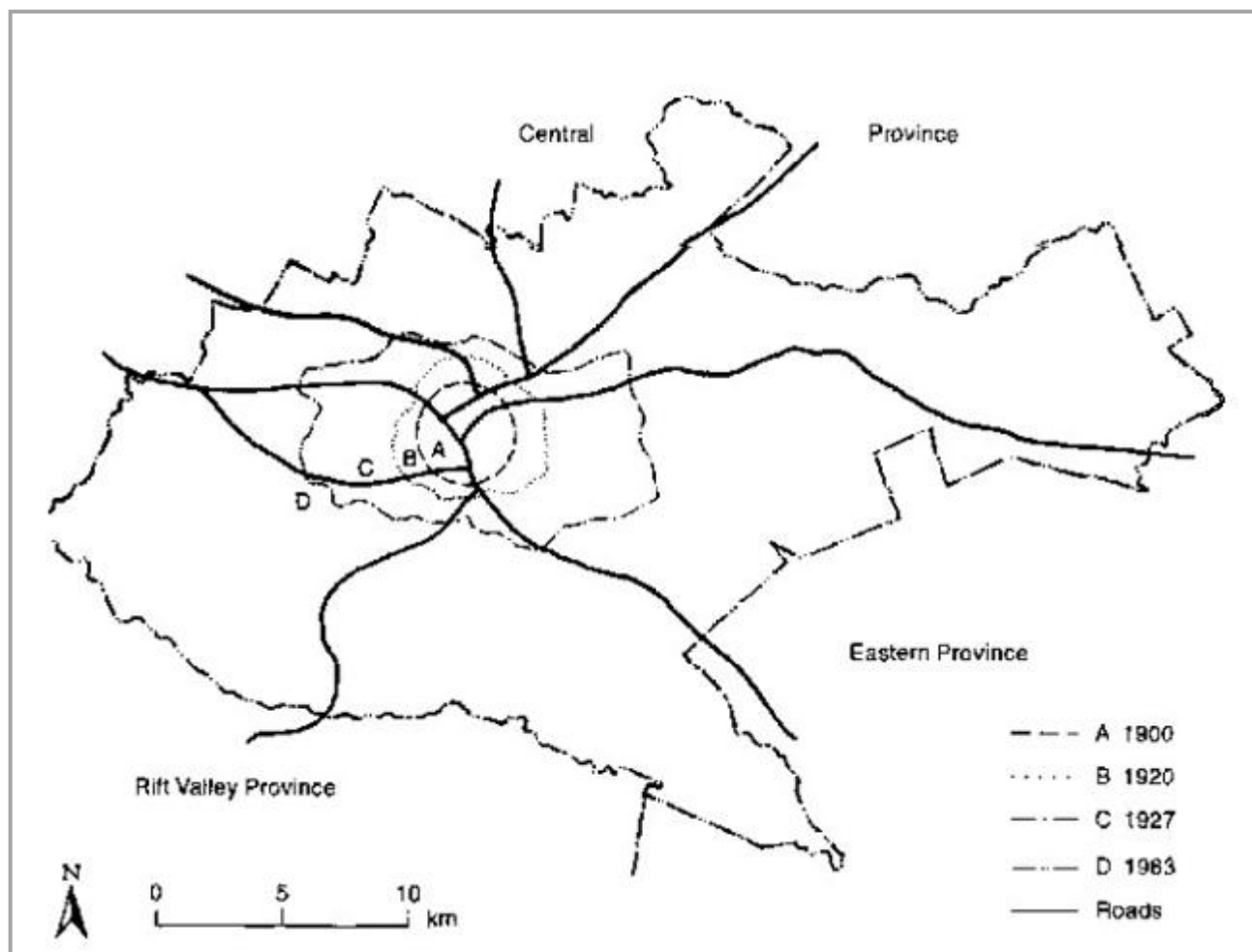


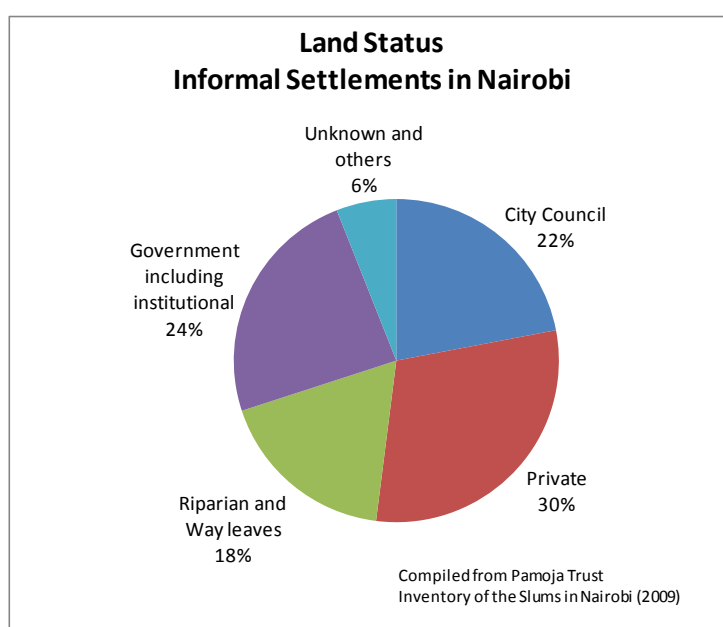
Figure 4-2 Nairobi Boundary Changes (1906 to 1963) Source: Obudho and Aduwo (1988:53)

An analysis of the spatial growth of informal settlements over time within the city displays two key aspects: first, the settlements have been expanding to nearby empty spaces over time; and secondly, the growth of settlements near or within land earmarked for way-leaves and utilities such as power, pipeline, road and railway. Informal settlement growth has also taken place in areas set aside as riparian reserves. These developments of riparian reserves have experienced negative environmental implications such as pollution arising from human waste disposal in the water/river systems. The environmental implications are discussed at length in Section 4.3.1. The growth of many settlements starts with a few structures, which over time grow to occupy nearby areas as more settlers move into the areas (**figure 4.4**). Land parcels not developed, including land set aside for rights-of-way is often targeted for settlement. Most of the informal settlements are located on flood plains, infrastructure way-leaves, abandoned quarries, steep banks of river valleys, as well as on undesirable vacant land, such as next to dump sites.

**Table 4-2 Population Sizes and Densities in Select Areas of Nairobi**

Settlement / Area	Population 1999	No. of Households	Density (Persons per hectare)	Population 2009	No. of Households	Area	Density (Persons per hectare)
<b>Low Density or High Income Areas</b>							
Karen	9764	3381	4	8796	2861	2730	4
Muthaiga	6786	1681	5	10815	3225	1410	8
Lavington	18966	5815	17	43122	11350	1100	40
Loresho	15784	5131	17	18010	5907	950	19
<b>Medium Density or Middle Income Areas</b>							
Langata	16118	5051	4	19515	5434	4450	5
Highridge	46642	13019	11	53720	16021	4230	13
Parklands	11456	3369	25	11117	3312	460	24
Kitisuru	27459	8603	13	31242	10142	2090	15
<b>High Density or Low Income Areas</b>							
Kibera Silanga	16518	6281	826	17363	6164	20	868
Korogocho Gitathuru	22899	7415	763	41946	12909	30	1398
Mukuru Nyayo	36232	10224	158	53303	17357	230	232
Mathare	69003	24525	460	87097	31426	150	580

Source: Compiled from GoK (1999) and (2010)



**Figure 4-3 Land Status of Informal Settlements**





Figure 4-4 Spatial and Temporal Dynamics within Mukuru Settlement Source: Google Earth

### 4.3.1 Implications for the environment, health and land use

The concentration of population, especially on inappropriate land, causes a variety of problems. Many of the informal settlements in Nairobi are located on riparian reserves and potential flood plains (**figure 4.5**). Nairobi's environmentally degraded squatter settlements are growing, as presented in Table 4.2. An estimated 40% of Nairobi's 3 million population live in these unplanned settlements (Lamba, 1994), with significant environmental implications to existing land-uses and ecosystems, mainly attributed to the lack of basic services.

The environmental impact of informal settlements in Nairobi, for example, from poor practices in disposing of solid waste and discharge of human waste into nearby rivers, is well documented (Oxfam-GB, 2009; Weru, 2004; Wegelin-Schuringa and Kodo, 1997; Alder, 1995). A number of associated health implications have been explored in different cases (Ziraba *et al.*, 2009; Gulis *et al.*, 2004; Amuyunzu-Nyamongo and Taffa, 2003; Lamba, 1994).

The growing numbers of people living within informal settlements and poverty in Nairobi has led to an increase in ill health and mortality, especially among children. The health of residents is continually threatened because of poor quality and overcrowded housing, and inadequate provision of safe water supplies, sanitation, drainage, and solid waste collection. According to Satterthwaite (2003a), urban poverty in these settlements has been linked to and is a cause of environmental degradation. The lack of access to sanitation, for example, forces settlement dwellers to defecate in the open or into waste materials ("flying toilets"<sup>8</sup>) because they have no toilets in their homes and public provision is either inadequate, too distant, or too expensive (UN-HABITAT, 2003b; Hardoy *et al.*, 2001). Where toilets are available, their discharge is not often connected to municipal sewer systems but rather, they empty directly into nearby rivers, causing pollution and even disease, especially to downstream water users. Similar observations were made in South Africa by Napier and Rubin (2002), who observed that several areas near rivers occupied by informal settlements without any or with only inadequate essential services, had experienced high levels of pollution in the river and the immediate environment.

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<sup>8</sup> 'Flying toilets' is a term used to imply human faeces wrapped in plastic and disposed of in drains or alongside roads and paths within informal settlements. This is an easy and less expensive way of disposal. Flying toilets are common where toilets are not available or not conveniently located.



**Figure 4.5** shows the location of Kiambu settlement near Ngong River. Toilets located along the river are often not connected to the sewer system and therefore discharge directly into the river, causing water pollution.



**Figure 4-5 Spatial Temporal Dynamics of Kiambu settlement** Source: Google Earth



Figure 4-6 Solid and Human Waste Disposal Mechanisms within Informal Settlements

### Solid and human waste disposal

Within the settlements, solid waste is dumped along the open drains and also on the riverside, especially by residents living in structures adjacent to riverbanks. Solid waste is also dumped in open spaces and drainage channels. This has led to a loss of aesthetic value and provided a good breeding ground for disease vectors.

Within many settlements, the soil characteristics are not suitable for the construction of pit latrines or soak pits. Structure owners construct toilet structures on the river banks which enables them to discharge human waste directly into the river using PVC pipes.

Discharging waste into rivers has negative implications for water quality and aquatic life. The water is needed by many consumers further downstream, for domestic and agricultural purposes. However, it is easier for landlords to discharge waste directly into the river, as it reduces the costs of maintenance and regular emptying.

Mapping the dynamics within settlements enables decision makers to visualise challenges, thereby improving their ability to propose suitable interventions.

## **Cholera Kills Nine People in Nairobi Slum**

*Nairobi — At least nine people have died of cholera in Mukuru Kwa Njenga slum, Nairobi. Sixty others were being treated on Friday. Ms Peninah Nzuki, a community health worker, was first alerted of the killer disease by a neighbour on Monday. She then took to hospital the first patient, a one-year-old child, but he died while being treated. "The water is dirty and the levels of hygiene are poor, thus the disease is spreading fast," she told the Saturday Nation.*

*"The outbreak is serious, almost as bad as one 10 years ago," she said.*

*On Friday, a woman died after complaining of dizziness and vomiting the previous night. Ms Mary Bahati, a vegetable vendor, responded to the cries of her neighbour, identified only as Rose, after a friend alerted her that he had heard someone vomiting next door. "She was all alone in the house but she died before we arrived at the hospital," said Ms Bahati.*

*According to the health officials, two children below two years died on Monday and Tuesday, and more remained at risk due to the open sewers in the slum.*

*Most residents blamed the situation on a water shortage, which had forced them to compromise on sanitation standards. By noon yesterday, public health officials had given five tablets a household to treat drinking water.*

*Cholera is an acute diarrhoea infection caused by the ingestion of the bacterium, vibrio cholerae. Transmission occurs through contaminated food or drinking water. The disease is characterized in its most severe form by a sudden onset of acute watery diarrhoea, that can lead to death through dehydration and kidney failure. The extremely short incubation period -- two hours to five days -- enhances the potentially explosive pattern of outbreaks. It is an extremely virulent disease, and can kill an adult within hours.*

**Source: Daily Nation 23<sup>rd</sup> October 2009**

Figure 4-7 Extract from Newspaper on Health Condition in a Nairobi Slum

### **4.4 Upgrading Settlements: Approaches, Actors and Challenges**

As noted above, informal settlements in Nairobi city house over 40% of the city's population, although they only occupy 5.8% of all land mass (Matrix-Development-Consultants, 1993). For this reason, Government and other stakeholder efforts are justified in addressing the plight faced by this significant portion of the city's population. Many of the interventions/upgrading initiatives within informal settlements are aimed at improving existing conditions in line with local and international plans, such as the Millennium Development Goals. The Government of Kenya, having regard to political and

financial realities, recognized the inevitability of slums and informal settlements as early as 1970, as is amplified in the 1970/74 National Development Plan. Since then, the evolution of policies and interventions dealing with informal settlements in Kenya can be classified into four stages, namely: provision of minimum services; extension of tenure security and physical upgrading; recognition of the legitimate role of low income settlers and other stakeholders in urban development; and lately the formulation of a comprehensive national slum upgrading programme under the Kenya Slum Upgrading Programme (KENSUP) (Government of Kenya, 2006). Over time there have been numerous strategies for upgrading informal settlements, but the primary goals of upgrading projects are to provide secure land tenure and to improve basic infrastructure and service delivery.

From the early 1970s, the magnitude of the housing problem in Kenya to a large extent determined the government's role in the strategy of addressing the housing shortages, especially in the urban areas. Government policy during this time shifted from conventional housing policy to a more pragmatic housing provision policy, as advocated by the Bretton Woods institutions and development agencies such as USAID. This saw the development of site-and-service schemes in various urban areas such as Kisumu, Mombasa and Kericho. The first scheme was established in Dandora, Nairobi and followed by urban projects in Mombasa and Kisumu. In the 1980s, the government recognized the legitimate role of the low-income majority and private and civic sector actors in urban development. This saw increased involvement of NGOs as well as international development agencies in various informal settlement improvement projects (Government of Kenya, 2006). Despite the effort to integrate a wide range of actors and an inclusive approach, the interventions do not seem to have adequately served the growing number of low-income groups, and therefore informal settlements have continued to grow.

Economic and social strategies have also been used to address challenges within the housing sector in Kenya. The strategic framework in the Poverty Reduction Strategy Paper (PRSP), the National Housing Policy and the National Plan of Action on Habitat Agenda on Shelter and Housing Settlements, have all recognized slum upgrading as an integral part of housing and shelter development.

Regarding upgrading, there has been a transformation in the approach by the Kenyan Government. In the 1960s and early 1970s the Government adopted a slum clearance

policy, which was replaced by the self-help approach in housing projects during the 1970s and 1980s. From the mid-1970s, self-help became the dominant housing delivery approach. Based on the concept of incremental housing three variants emerged: (i) sites-and-services schemes – provision of vacant land with basic services for residents to construct their own dwellings; (ii) embryonic or core housing units; (iii) squatter settlement regularization and *in situ* upgrading (non-relocation). By the 1980s, the enabling approach had emerged, which saw the role of the Government shift from that of housing provider to facilitator. The Kenyan Government was expected to remove obstacles and constraints that blocked access to housing and land, such as inflexible housing finance systems and inappropriate planning regulations, while people were to build and finance their own housing (Government of Kenya, 2006). Key characteristics of this approach include:

1. The provision of minimum services,
2. Extension of tenure security and physical upgrading and,
3. Recognition of the legitimate role of the low income earners in urban development.

This enabling approach, in which the Government concentrated more on creating incentives and facilitating measures to enable other stakeholders to provide housing and basic services, permits all stakeholders, including communities, to play an active role. This is discussed at length in Chapters 5 and 6.

Pragmatic approaches, such as *in situ* upgrading, are popular given that they provide for the inclusion of basic services, as well as legalizing and regularizing the properties in situations of insecure or unclear tenure. The physical upgrading of infrastructure includes improvements to access roads, streets, footpaths, drainage, electricity, water supply, solid waste collection and street lights. The residents for their part are involved in the construction of their own housing stock on a self help basis. However, *in situ* approaches may include options for loans to residents for home improvements (UN-HABITAT, 2003a). *In situ* approaches offer more advantages over the clearance and relocation approach. The former are less costly with fewer disturbances to the social and economic life of the community. This community-sensitive approach enables participation, especially by the urban poor to improve their own living conditions and take a role in decision making. This aspect forms the subject of discussion of Chapter 6, where participation by informal settlement communities is discussed. Participation by communities is examined with regard to how it is affected by the integration of GI in the upgrading processes. In Kenya the design of upgrading approaches has taken a more inclusive approach because this has proved to be successful in generating ownership of upgrading processes by communities. Ownership by communities is recognized as a prerequisite for sustainable

urban upgrading and development projects (Imperato and Ruster, 2003; Otiso, 2003; Werlin, 1999).

#### **4.4.1 Kenya Slum Upgrading Programme (KENSUP)**

KENSUP is the outcome of a memorandum of understanding between the Government of Kenya and UN-Habitat in 2003, which was aimed at the formulation and implementation of a nation-wide slum-upgrading programme. The programme targets the production and improvement of about 45,000 units annually nationwide at an approximate cost of US\$ 440,000,000 (UN-HABITAT, 2008)

KENSUP mirrors the Government's commitment to addressing urban poverty, as expressed in the Kenya Government's Poverty Reduction Strategy Paper (PRSP) and the Economic Recovery Strategy for Employment Generation and Wealth Creation (2003 – 2007). These policies have brought slum upgrading to the forefront of national development priorities. The programme also aims at improving the lives of people living within informal settlements in all urban areas of Kenya, thereby contributing to poverty reduction and the fulfilment of the Millennium Development Goals, specifically Goal No 7 target 11 (UN-HABITAT, 2008). Current project activities under KENSUP are taking place in Nairobi, Kisumu, Mavoko, Mombasa and Thika municipalities.

The implementation of KENSUP broadly falls under three key institutions: the Government, Local Authorities; and the United Nations Human Settlement Programme-UN-Habitat. The programme is coordinated through the following institutions: the Inter-Agency Steering Committee (IASC), which is the supreme programme organ composed mainly of accounting officers of key relevant Ministries, local authorities, UN-Habitat and development partners.

The specific programme objectives are:

- To harmonise, rationalise and institutionalize a broad range of shelter-related policies including the creation of institutions and mechanisms for sustainable financing and development of shelter and related infrastructure.
- To operationalize the concepts of decentralization, partnerships, consultation, stakeholder participation, consensus building, leadership and the empowerment of beneficiary communities in upgrading projects.



- To establish an institutional framework and mechanisms for effective implementation of slum upgrading and shelter related programmes.
- To establish the nature of the socio-economic and physical conditions prevailing in slums and informal settlements, through relevant mapping, in order to set the stage for improvement in land tenure, basic services, livelihoods and housing structures.
- To develop and implement appropriate service improvement including design, delivery strategies and approaches.
- To build or strengthen the capacity for research, planning, implementation, monitoring, evaluation and replication of shelter and human settlements programmes at the Central Government, local authority and settlements/community levels.

#### **4.4.2 The institutional set up**

KENSUP activities are managed and co-ordinated by five bodies: the Inter Agency Steering Committee (IASC), the Programme Secretariat, the Programme Implementation Unit, the Settlement Project Implementation unit and the Settlement Executive Committee. The Inter Agency Steering Committee (IASC), which is the oversight body, provides guidance, facilitation and support to the programme process. It also advises the Minister in charge of Housing and Human Settlements and the Executive Director of UN-Habitat on programme matters. The committee comprises seven permanent secretaries from relevant Ministries (Lands and Settlement, Housing, Local Government, Roads and Public Works, Finance, Foreign Affairs, Health and Works), the permanent representative, the Kenya mission to Habitat, the Deputy Executive Director of UN-Habitat, the Provincial Commissioner, and the Mayor/Town clerk of the relevant Local Authority. The Director of Housing is the secretary to the IASC.

A Programme Secretariat that co-ordinates programme planning, implementation and monitoring is based at the Housing Department of the Ministry of Housing. The Ministry is also charged with the formulation and implementation of the national housing policy. Additionally, it has been mandated to give policy guidance on slum upgrading at the national level.

The Programme Implementation Unit (PIU) which is based in the City Council of Nairobi is responsible for implementation of the upgrading programme within the City of Nairobi. The Settlement Project Implementation Unit (SPIU) is an offshoot of the PIU and is based on site in the settlements. It comprises technical staff drawn from the technical departments

of the local authority who oversee project implementation on site on a day to day basis. The SPIUs work in co-ordination with PIU and Programme Secretariat.

The Settlement Executive Committee (SEC) is composed of 15 directly elected settlement stakeholder representatives, and three ex-officio members (area councillor, area chief, Area District Officer). This committee identifies all necessary settlement stakeholders, project intervention needs, communal areas and facilities, mobilises grassroots participation, and determines tenure issues.

#### **4.4.3 Challenges to upgrading**

The complex nature of informal settlement dynamics has produced mixed results and outcomes for upgrading programmes. Past upgrading projects in Kenya have had both strengths and shortcomings at policy level. The shortcomings include: land tenure complications, lack of affordability and administrative inefficiency (Syagga *et al.*, 2001).

The primary constraint with regard to the improvement of living conditions for informal settlements in Nairobi is, and remains, insecure land tenure. This has led to a prevailing situation where absentee landlords build semi-permanent rooms for rent without providing adequate water and other environmental sanitation facilities for their tenants. Poor and inadequate access routes within these settlements also hinder service improvements.

Affordability and unrealistic high standards have been a major problem for the urban poor. The World Bank-supported upgrading projects in Nairobi were more concerned with the cost recovery aspect, thereby locking out potential urban poor residents. The situation is clearer in the development of the second and third projects of sites-and-services schemes, where affordability is determined before development begins, without any consultation and participation from potential beneficiaries that could determine their needs. Another drawback faced in upgrading programmes was the high standard set for housing, infrastructure and service provision. Although lower standards were applied, they were still beyond the means of the poor, for whom they were intended (Syagga, 2001:8).

Although the Provincial Administration (which includes Chiefs) is to be abolished under the current constitution, power dynamics shape the outcome of upgrading within upgrading programmes. Land ownership and housing development rights are vested with the area Chiefs who draw their power from the Chief Authority Act (Cap 128). The

influence of local Chiefs is illustrated by COHRE (2005b) during an interview with leaders from Kibera settlement, where it is observed that:

*there is nothing anyone can do in the informal settlements, from the repairing of one's house to the building of toilets, without the authority of the Provincial Administration, through the local Chiefs.*(COHRE, 2005b: 58).

Chiefs and local leaders play an important role in the allocation of land within informal settlements. Invoking the Chief Authority Act enables them to exercise control over activities within their jurisdiction. The ability to control land allocation and resource use within informal settlements is seen to hinder the majority of the residents and favour those in power. Power relations are further discussed in Chapters 5 and 6.

The lack of formal recognition of the informal settlements by the Government has given rise to some of the existing problems which are due to the administration having greater control, thus leaving residents more vulnerable to eviction. This also has implications for slum-upgrading projects. For example, the Kibera Rent and Housing Forum emphasised that slum upgrading must address the “governance problem” in the slums. Part of the problem is the lack of formal recognition for the informal settlements, which gives the existing, problematic administration greater control and leaves the residents more vulnerable to eviction (COHRE, (2006: 83-92).

Another challenge observed in many of the settlement upgrading programmes is the uncoordinated nature of Government activities and initiatives. The various branches of Government sometimes disseminate different, often conflicting information on important issues. In the context of slum upgrading, for example, one actor supports eviction of residents who are actually meant to benefit from a slum-upgrading programme implemented by another. In many instances the various actors operating in the informal settlements have no common rules of engagement and there is no broader framework to align their different activities (COHRE, (2006)

### Slum upgrading initiative hits snag

Uncertainty haunts the ambitious multimillion slum upgrading project (KENSUP) that was scheduled to end in 2020. Dubbed "a core poverty programme aimed at housing those living in informal settlements", the programme appears headed to a halt.

According to the Housing Secretary, the work is on course and the scheme will ultimately serve the intended purpose. But according to sources in the Housing ministry, effects of the post-election violence forced the Government to cut off expenditure on the KENSUP project. Further, UN-HABITAT, which was to be the key partner in the project, is alleged to be pussyfooting and shows little support. "The UN body has all of a sudden shown no commitment in its role as the chief partner in resource mobilization," says the source at the ministry. "The last time we heard about their action plan was in 2006."

Lack of funds, capacity and donor support are, however, among the key factors that have slowed down the project. Unless a major drive is conducted to mobilize resources and fast track the projects, the complications dim hopes of achieving the MDGs. But Housing Minister puts on a brave face saying: "We are on course. The programmes will be implemented though it might take longer."

Figure 4-8 Upgrading challenges in Kenya

Source: The East African Standard 11<sup>th</sup> June 2009

## 4.5 Urban Planning Framework in Kenya

The urban planning framework in Kenya has its origin in the British town planning system. Before independence, the institution of urban planning was mainly focused on land-use planning within the key urban centres of Nairobi and Mombasa under the Town Planning Ordinance of 1931. The first master plan for Nairobi, Kenya's capital, for example was prepared in 1910 and was not revised until the late 1960s. The slow development of urban planning frameworks and policy has had significant implications for the management of urban growth country-wide. The fast growth of urban centres against the backdrop of a limited planning institution, for example, meant that growth within urban areas was uncontrolled. Much of the development within Kenyan urban centres is haphazard and has mainly taken place outside urban planning intervention. This is attributed again to limited capacity in terms of the requisite technology, human resources and financial outlay, to

prepare timely and sustainable physical development plans by the planning agencies (McLaren, 2009)

The key statutes relevant to the urban planning institution are the Physical Planning Act (Cap 286), the Government Lands Act (Cap 280) and the Local Government Act (Cap 265). Other relevant statutes governing use and management of urban land include the Environmental Management and Coordination Act (No. 8 of 1999), Registration of Titles Act (Cap 281) and the Land Titles Act (Cap 282). The Physical Planning Act provides for plan formulation by the Director of Physical Planning, registered planners or even local authorities. However, the implementation of plans is solely vested with the local authorities. The lack of harmonisation between planning and implementation functions has resulted in physical development plans not being informed by local needs and therefore not addressing local realities, resulting in apathy during implementation.

Although planning laws in Kenya are centrally focused on land use planning, they can only function effectively in conjunction with other sets of laws as stated earlier. However, this setup has resulted in conflicts, in particular between agencies concerned with the same activities, sometimes leading to a hindrance in development. Existing planning regulations, on the other hand, have prescribed high standards of development for infrastructure and shelter, which have excluded the many low income groups who depend on the informal sector for a living. Squatter and spontaneous areas have grown, and they require a different approach in terms of urban management from the traditional urban one (Wekwete, 1995).

#### **4.5.1 Actors and stakeholders**

The relevant statutes mentioned above shed light on the actors and stakeholders with regard to planning. The upgrading of settlements is perceived to be a planning aspect and is therefore regulated by existing laws and regulations governing development within human settlements, especially within the urban context.

With regard to settlement planning, the Department of Physical Planning is responsible for identifying and developing suitable approaches to help address existing challenges related to land-use and environmental aspects in informal settlements. Besides the Director of Physical Planning, other actors as required by the law are integrated in the process. These include the local authority where there is an earmarked settlement or planning

intervention, and relevant government ministries (health, public works and public administration under the office of the President).

Besides Government actors, local and international non government organisations, including civil society organisations, play an important role in the upgrading process given their grass-roots mobilisation and community based intervention approaches. In Kenya key organisations that have spearheaded upgrading activities include the United Nations (UN-Habitat), Practical Action, the Pamoja Trust and the Muungano wa Wanavijiji. Activities supported by the latter organisations are explored in Chapters 5, 6 and 7.

Communities (individuals or groups) are equally important in upgrading processes. The role of communities has been recognised as crucial in ensuring projects meet their objectives. Community-led interventions are typical of bottom-up planning approaches and have replaced earlier top-down approaches where structures for community participation were not supported.

#### **4.5.2 Community Participation**

Hardoy and Satterthwaite (1989:15) argue that the poor, who organize, plan and build slums and informal settlements illegally, are “the most important organizers, builders and planners of developing country cities”. However, most governments do not see them as such, and many refuse to recognize them as citizens with legitimate rights. Emerging planning paradigms and regimes have embraced more community-oriented approaches paving the way for enhanced participation by concerned members of the public, including the urban poor.

The Physical Planning Act most importantly provides a framework for public participation in planning and plan implementation. The Act, for example, requires that public notice be given under section 41 (3), inviting comments and/or objections to proposed planning actions. This process is considered important especially in instances where human settlements are concerned. The Act similarly empowers the public to initiate planning activities. This, however, has to be done with the consent of the Director of Physical Planning. Within the Act, participation is also encouraged where planners are advised to obtain and integrate community views and aspirations within planning proposals. Before plan approval, the planner is required by law to make public any proposals, in order to solicit views and or objections from concerned parties. This approach provides for

meaningful participation and thereby integration of community decisions within planning processes.

Closely associated with participation is the implementation of action planning and participatory development approaches, especially at neighbourhood level (including informal settlements). The approaches which are used by both government and non government actors within upgrading programmes enable communities to participate fully in decision-making processes. Communities are, for example, involved in problem identification, analysis and generation of alternative approaches to address existing challenges. In the process, ownership by the community is attained which translates to sustainable interventions. In Chapter 6, an analysis is made of how participation is enhanced as a result of integrating GI tools within upgrading processes.

## **4.6 Integration of Geo-Information Tools: the Process and Actors**

The inherent capabilities within spatial tools such as visualization and quantification after spatial analysis justify the use and integration of GI in upgrading processes. The cases presented here demonstrate how the tools have enabled communities and development partners to develop models and information regarding existing challenges within the respective settlements. Information generated using spatial tools has been useful in decision-making processes, thereby enabling all actors to meet their development objectives.

### **4.6.1 Case 1 Mapping water and sanitation in Silanga, Kibera**

This project involved the improvement of sanitation by constructing new toilet blocks and the construction of a water distribution and storage system within the informal settlement. Before the project, pit latrines were the major method of human waste disposal while water was provided mainly through stand pipes located across the settlements. The poor human and solid waste disposal methods were a threat to the Nairobi dam.

In a bid to address the pollution of the nearby water resources, new toilet blocks connected to the municipal sewer system were to be constructed. The process commenced with the mapping of the existing toilet facilities. The identification of spatial

locations for facilities enabled stakeholders, for example, to determine which facilities discharged waste into the nearby dam. Similarly, mapping helped to determine which areas did not have access to sanitation facilities.

*The Methodology.* Spatial data pertaining to the settlement were obtained from a high-resolution satellite image obtained in 2004. All existing spatial objects such as structure/buildings, roads, vegetation, rivers and streams, were identified and mapped. Attribute data was collected by using a checklist, as well as through observation methods. Attribute data on water and sanitation facilities that was collected included their condition, ownership and connection status (whether connected to sewer lines or discharged into a dam). The data collectors were drawn from the settlement and comprised social workers and youth group members. The model below shows the approach used by Practical Action to map water and sanitation infrastructure within Kibera settlement.

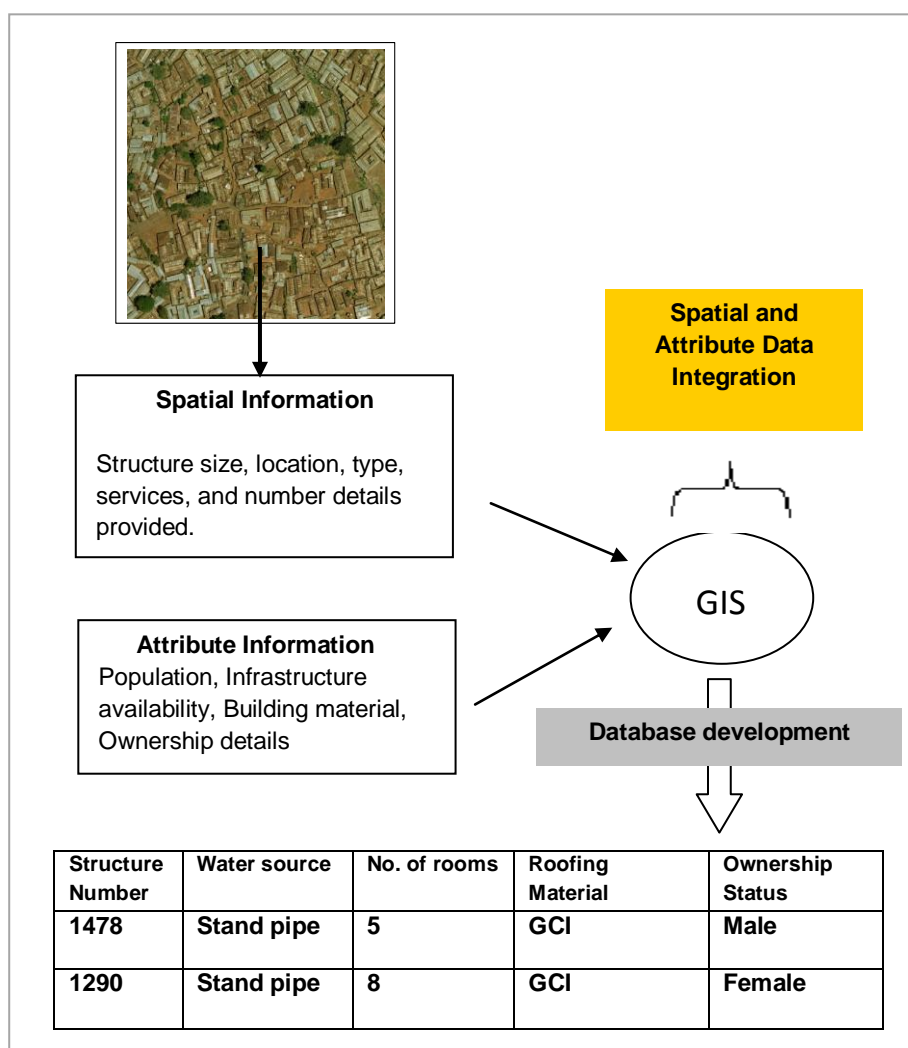


Figure 4-7 Conceptual Model, Mapping and Integration of GIS Tools Source: Practical Action, 2007



The use and application of GIS tools enabled stakeholders, for example, to use buffering tools to develop service coverage models for water and sanitation infrastructure. Areas not adequately covered by services were identified and this information was used to determine where to construct new facilities.

It is important to note that, the use of GIS tools enabled stakeholders to accurately quantify service coverage as well as delineate areas without adequate facilities. Most importantly, the spatial outputs generated guided the stakeholders on decision-making with regard to resource allocation and future interventions.

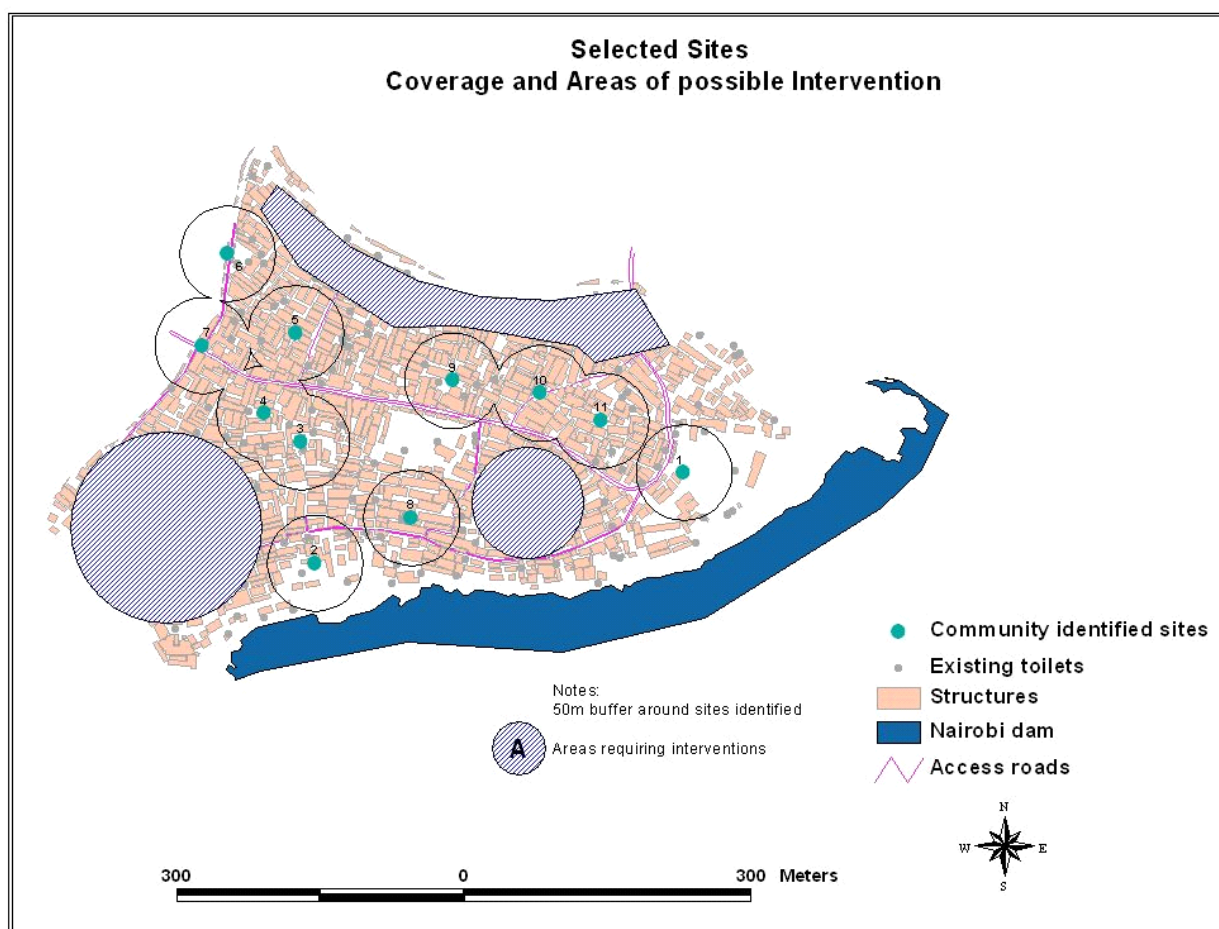


Figure 4-8 Model Showing Facilities and Intervention areas, Silanga Village, Kibera Source: (Practical-Action, 2007)

#### 4.6.2 Case 2 Kiambu (settlement profile and sector analysis)

In this project, Maji na Ufanisi (a local non-governmental organisation) and the community were involved in the improvement of general environmental conditions within the

settlement. The lack of up-to-date information regarding the situation within the settlement compelled the NGO to embark on a settlement profiling and mapping exercise, which would generate useful data regarding the settlement.

Using remote sensing data obtained from high resolution satellite imagery (**figure 4.9**), the community embarked on a settlement mapping exercise. Attribute information was collected from existing structures and used to develop spatial models, showing aspects like water points, toilets, solid and human waste disposal methods, accessibility, urban agriculture, health, population, structure ownership and housing conditions.

Statistical analysis of the attribute data was carried out to generate tables and graphs showing settlement dynamics. Most relevant was the visualisation of settlement dynamics which was carried out in a GIS environment. Visualisation assisted the stakeholders in determining areas that required specific interventions and what resources would be required to address the challenges.

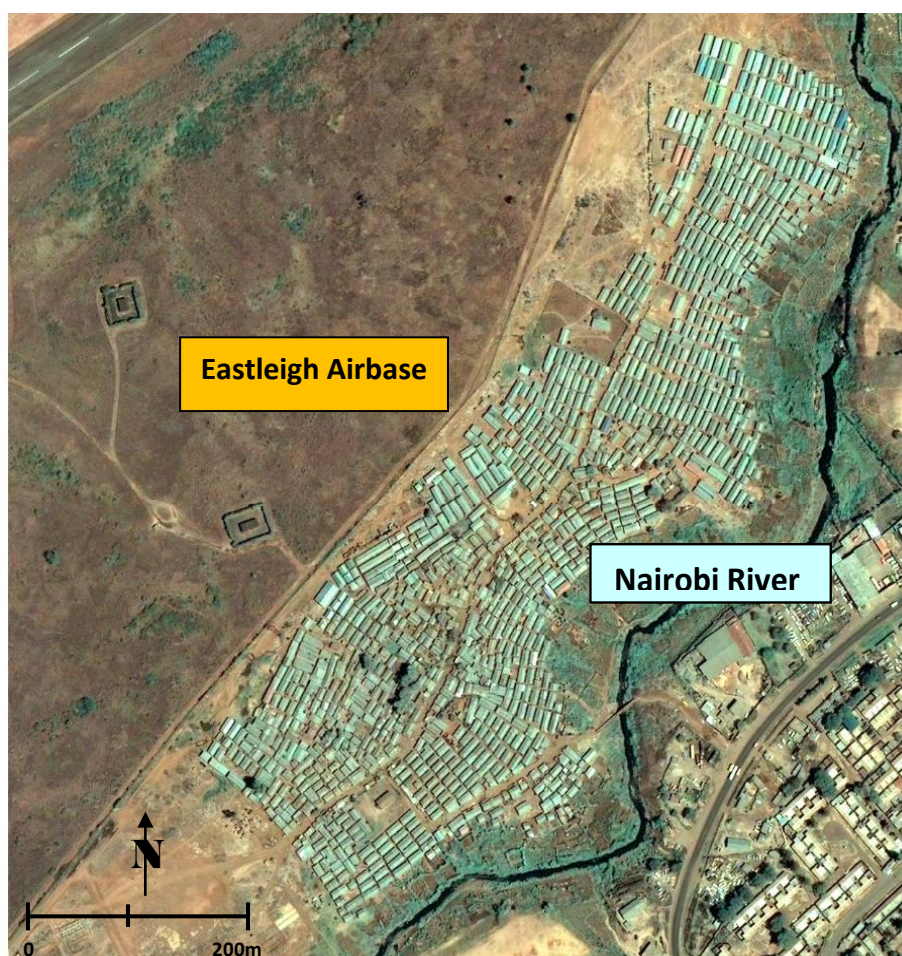


Figure 4-9 High Resolution Satellite Image, Kiambiu Settlement, Nairobi *Source: Google Earth*

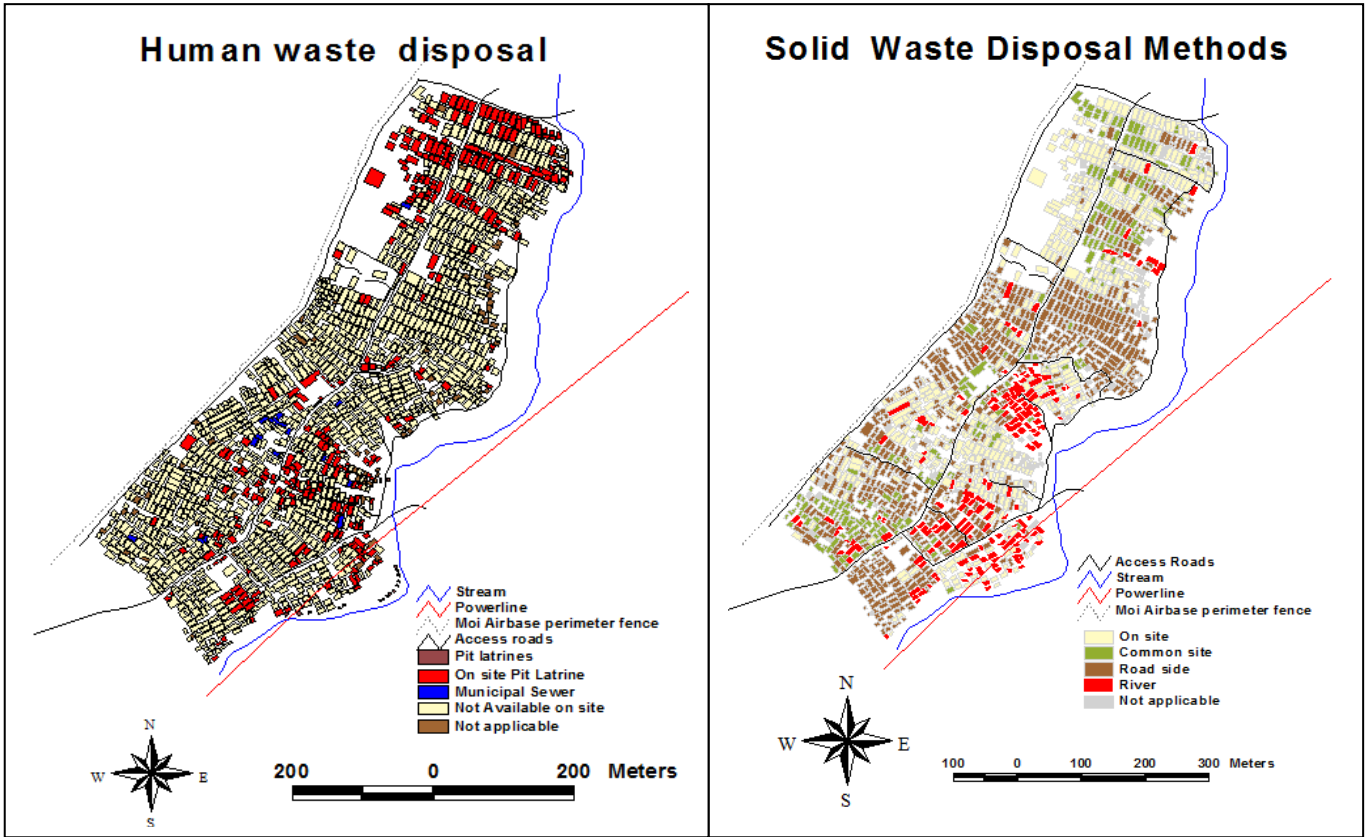


Figure 4-10 Human and Solid Waste Disposal Methods in Kiambiu Settlement: Source: Maji na Ufanisi

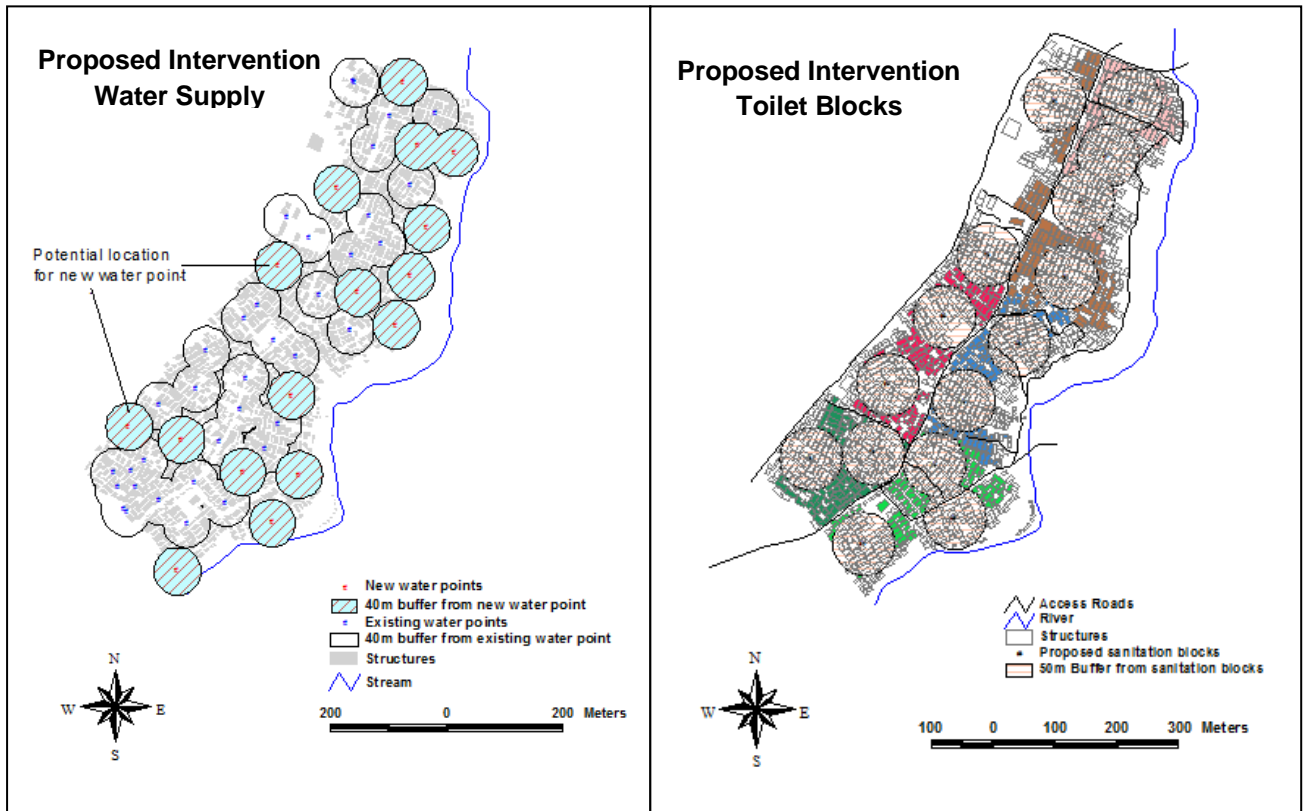


Figure 4-11 Proposed Interventions Based on Spatial Analysis of Attribute Data, Kiambiu Settlement



## 4.7 Integrating Geo-Information tools: Implications for upgrading

### The process

The justification for integrating spatial tools and information tools, for example, draws from inherent capabilities such as visualisation and integrated analysis of attribute and spatial data-sets. Planning and decision-making processes are problem driven and rely on data which underscores the significance of GI tools in facilitating them. Reliable and accurate information regarding settlements is the basis for improving decision making and resource allocation. The conceptual framework presented in Chapter 2 outlines how existing challenges within settlements trigger actions by stakeholders locally and internationally. As outsiders, many of the stakeholders rely upon tools like satellite imagery or aerial photography to develop initial impressions and quantification of settlement dynamics.

The key role played by external or development partners is worth attention. The skills and knowledge necessary for using or integrating GI within upgrading processes may not be available within the settlements. Development partners including NGOs play an important role in capacity building within communities and making available the required technology. Communities have demonstrated the ability to manage some of the mapping and data collection activities upon receiving the necessary training and support.

The provision of spatial data and skills used for mapping or data collection activities does not necessarily imply it is the agenda of the “outsiders” that prevails in the upgrading process. The emerging planning approaches necessitate development partners and communities coming together to address existing challenges within the settlements. Inclusive approaches provide for the active participation of communities, which is further enhanced by the integration of GI tools.

### *Participation*

An upgrading process in which GI tools have been integrated provides avenues for community participation in various activities. Owing to their good knowledge of the settlements, resident communities are best placed to map and enumerate existing conditions. This reinforces the importance of community-based local knowledge resources. Developing a settlement profile not only provides an opportunity for the community, but also sets the ground for ownership of the proposed intervention. Participation by settlement youth and women, who at times may be unemployed, is seen as both a source of income and knowledge about their environment. Participation by communities is also observed at the planning and implementation stages, where the data

collected and information generated is used for decision making. The quantification of settlement dynamics using GI tools provides the basis for better planning. Informed communities become empowered and are able to participate meaningfully in decision-making process without suffering from lack of information or knowledge.

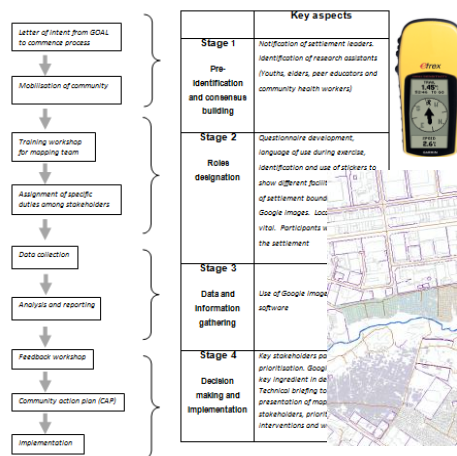
#### *Addressing existing challenges*

Spatial data alone cannot meet information requirements for upgrading processes. This necessitates the supplementation of data with attribute data from surveys which are conducted by communities. Stakeholders supported by spatial information are able to formulate interventions to address challenges within the settlements. Accurate information presented on the existing situation provides the basis for transparency in planning, by contrast with situations where such information is lacking. In essence, integrating GI tools provides for better governance in addressing challenges within informal settlements. The potential of GI tools in this regard is further explored in Chapter 7.

## **4.8 Conclusion**

This chapter discusses the salient issues regarding urban growth in Kenya, especially with regard to the spatio-temporal dynamics of informal settlements and its implications for the environment. To address challenges within these settings, various approaches have been adopted which involve the government, external agents and communities within the settlements. However, challenges still exist within the institutional set-up, as well as the socio-economic landscape, at national and settlement level. GI tools have been integrated in various settlement upgrading processes to assist decision makers to better understand the challenges facing the settlements.

Accurate information is viewed as an important ingredient in planning processes, without which decision-makers are unable to put forward meaningful interventions. In the following chapter, upgrading processes are analysed in detail, showing how GI tools are integrated as well as the role played by various actors in the process. Additionally, the chapter demonstrates the use of various GI tools and their impact on upgrading processes. This sets the stage for further analysis on who participates in the upgrading process (Chapter 6).



# Chapter 5

## Upgrading Processes and Integration of Geo-information

## **Chapter 5: Upgrading Processes and Integration of Geo-Information**

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*“The process is equally, if not more, important than the outcome of the activities” (SIPA, 2005: 12).*

## **5.1 Introduction**

This chapter examines the upgrading process, taking into account the use and integration of GI tools to support decision making and planning. Within the cases presented of Mukuru Kayaba, Korogocho and Mahira, the key upgrading stages are mapped and subsequently show how the GI tools have been integrated within the process. The process shows the roles of key stakeholders, including communities and development partners (NGOs and international development agencies). Also discussed are the underlying political processes and barriers to the effective use and integration of GI tools in upgrading processes.

The chapter aim therefore is;

*To examine the integration of Geo-Information tools in the upgrading process for informal settlements, taking into account the tools used and role played by the various stakeholders/actors, including communities.*

To this end, the research has set out the following objectives to develop the argument and provide comprehensive analysis.

- i. Map the key upgrading stages and show how GI tools are integrated in the process;
- ii. Examine how the integration of GI shapes existing political structures and relations within the settlements;
- iii. Examine the barriers towards effective integration of GI tools in upgrading;
- iv. Explore emerging ethical issues arising as a result of integrating GI tools in upgrading processes.

## **5.2 The Theoretical Underpinnings**

Foucault put forward the concept of governmentality, with relation to the close relationship between mapping and government and the need to manage space. Governmentality is facilitated through “mundane” practices, interactions and institutions which instil certain knowledge and habits and encourage individuals to actively participate in governing their



own behaviour and that of others (Rose and Miller, 1992:175). Mapping, census or other enumerations are viewed as processes performed by institutions whose objective is to define and regulate the population (Foucault, 2007). Space, knowledge and power according to Foucault are closely related and attempts to separate them make them impossible to understand (Foucault, 1984).

GIS tools are often linked with the process of map creation, which at grass roots level is closely linked to collaborative planning. Maps can be a key component in grassroots change efforts (Talen, 2000; Elwood and Leitner, 1998), and can be an important component of the functions of public and private organisations, and help to illuminate issues of equity and advocacy upon which a community may organize and take action (O'Looney, 2000; Harris, 1998).

Epistemologically, GI tools are perceived as positivist, given their reliance on quantitative and empirical approaches (Sheppard, 2001a:8). GIS and associated tools are seen to aid the collection of evidence and knowledge to support enquiries about the world. The positivist view of the purpose of science is simply to stick to what we can observe and measure. Positivist approaches to problem solving are supported by GIS tool application, especially where spatial knowledge acquisition is considered key to solving problems and enhancing understanding of the world. Critics of GIS-based approaches maintain that the tools are likely to enhance social and geographical inequalities owing to the emerging digital divide and unequal access to GIS. As a consequence, it is argued that GIS facilitates practices that favour those with access to the technology (Pickles, 1991). In order to overcome the limitations of GIS and enhance its use, emerging research is focusing on the following key areas:

- i. Whether GIS can be used by grassroots organizations as part of participatory decision-making to empower themselves within society.
- ii. What strategies can reduce barriers in accessing technology, especially GIS?
- iii. What would be the implications for communities and organisations that used the technology? (The question of whether use of GIS by community organizations would enhance their ability to represent and reflect residents' views).

A central point of debate has been whether the use of GIS technology might empower communities or social groups that have been marginalized in decision-making, or whether it will tend to consolidate the power of existing dominant actors, furthering the

marginalization of others (Harris and Weiner, 1998; Harris *et al.*, 1995). Regarding empowerment and marginalisation, according to Clark (1998), any tool that fosters information access, management, and analysis can be used in liberatory or repressive ways. In this regard, GI tools have the potential to exclude and marginalize individuals and communities because of technical skill requirements, and reliance on information that lends itself to cartographic and quantitative analysis.

The integration of GI tools in planning and indeed upgrading processes advances a rationalist approach to decision-making. This approach is viewed as an acceptable tool for information analysis and decision-making although it reinforces the hegemony of instrumental rationalism, at the expense of other approaches and knowledge systems (Aitken and Michel, 1995; Harris *et al.*, 1995).

### 5.3 The Upgrading Process and Procedures

*“Large-scale, replicable upgrading of informal settlements is only possible through the use of spatial information technologies.. For GIS to be used effectively, it has to support this process. It is not simply a technical tool to underpin physical development...it should be seen as a tool that liberates local authorities, communities and professionals”* (Abbott, 2003:578).

The upgrading process and cycle broadly consists of five stages namely pre-identification and consensus-building, prefeasibility studies and program identification, feasibility studies and program design, establishing a program monitoring and evaluation system and an implementation phase (Imperato and Ruster, 2003; Davidson and Payne, 2000).

#### 5.3.1 The process / steps in upgrading

The process in Mukuru involved 4 key stages each defined by unique activities (**figure 5.1**). The pre-identification and consensus building stage was characterised by the introduction of the project to the community by the project initiators, Goal-Kenya. This stage also involved the mobilisation of community members to carry out specific tasks such as mapping and enumeration. Similarly, the initial stage in Mahira, was characterised by community mobilisation and sensitization (**figure 5.2**). This was facilitated by Pamoja Trust who supported the community in the upgrading process. In contrast, the initial stage of upgrading in Korogocho started with a government notice on the intention to upgrade the settlement. The process in the later saw the implementation

of residents committees within each constituent village of Korogocho, formed to oversee upgrading activities within their areas of jurisdiction (**figure 5.3**).

The intermediate state in Mukuru involved role designation where community members who were identified to carry out specific tasks were trained for example of the use of satellite images for identification and mapping of water and sanitation infrastructure. At this stage, a questionnaire was developed by the community with the support of Goal-Kenya and was to be used for collecting attribute data pertaining to infrastructure. In Mahira, the intermediate stages involved the profiling of the settlement, collection and analysis of data. In Korogocho, the initial phase was followed by the data collection and development of a settlement database. One of the key differences between these cases was in the approach and integration of community support. In Mukuru, the community was trained by Goal-Kenya on the use of satellite imagery to collect data. The community similarly was involved in the pre-analysis of the data to develop spatial models of the settlement (**figure 5.4**). In Mahira, Pamoja Trust provided much of the technical support including the use of GPS tools to map the settlement boundaries. The data collection and boundary delineation process in Korogocho involved the Korogocho residents' committee and Government agencies (provincial administration and Ministries of Local Government and Lands and Housing officials).

The later stages of the upgrading process in Mukuru involved decision making and implementation of projects to address environmental health challenges. The community at this stage had an opportunity to verify the data collected and assembled by the mapping teams. Additionally, the information was used within the community action planning phase to determine suitable interventions. The community action planning sessions involved all stakeholders giving input regarding the water and sanitation status in Mukuru and how to address existing challenges. It was at this stage where prioritisation of challenges to be addressed within the constituent villages of Mukuru was carried out (Table 5.1). The key agents involved in the community action planning sessions and their roles are discussed in section 5.2.3. The data collected in Mahira was subjected to verification by the community before presentation to the City Council of Nairobi. It is important to note that the community in Mahira was more concerned with securing land tenure after which they would embark on improvement of housing and related infrastructure. According to Payne (2005:137), it is important to provide a form of tenure to communities which is sufficient to ensure protection from eviction. This action would

subsequently motivate them to invest resources towards improving on housing and living conditions. In Korogocho, the later stages to the upgrading process, involve the implementation of projects such as new roads and drainages. It is expected that the community will benefit from secure tenure and better infrastructure which will be put in place by the government and other supporting agencies.

The processes outlined are similar to the rational decision making approach as discussed in the literature review section 2.6. The approach according to Alexander (2000), aims at problem solving and involves multiple stakeholders. It commences with a problem identification phase, and culminates in the implementation of agreed interventions or choices. An additional feature in the approaches presented here is the notable involvement of settlement leadership and communities before the commencing the upgrading activities.

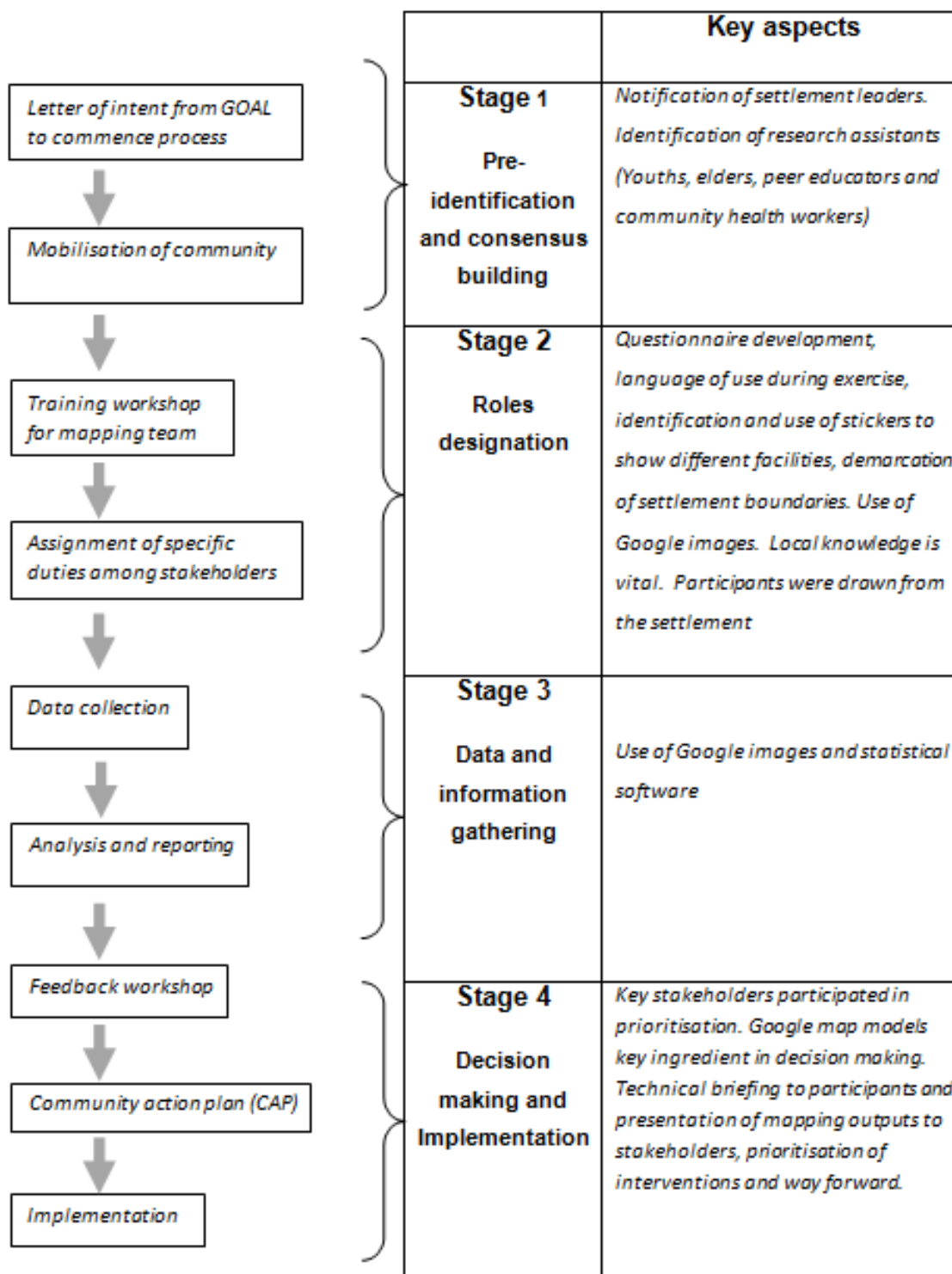


Figure 5-1 Mukuru Upgrading Process Including the Integration of Geo-information tools

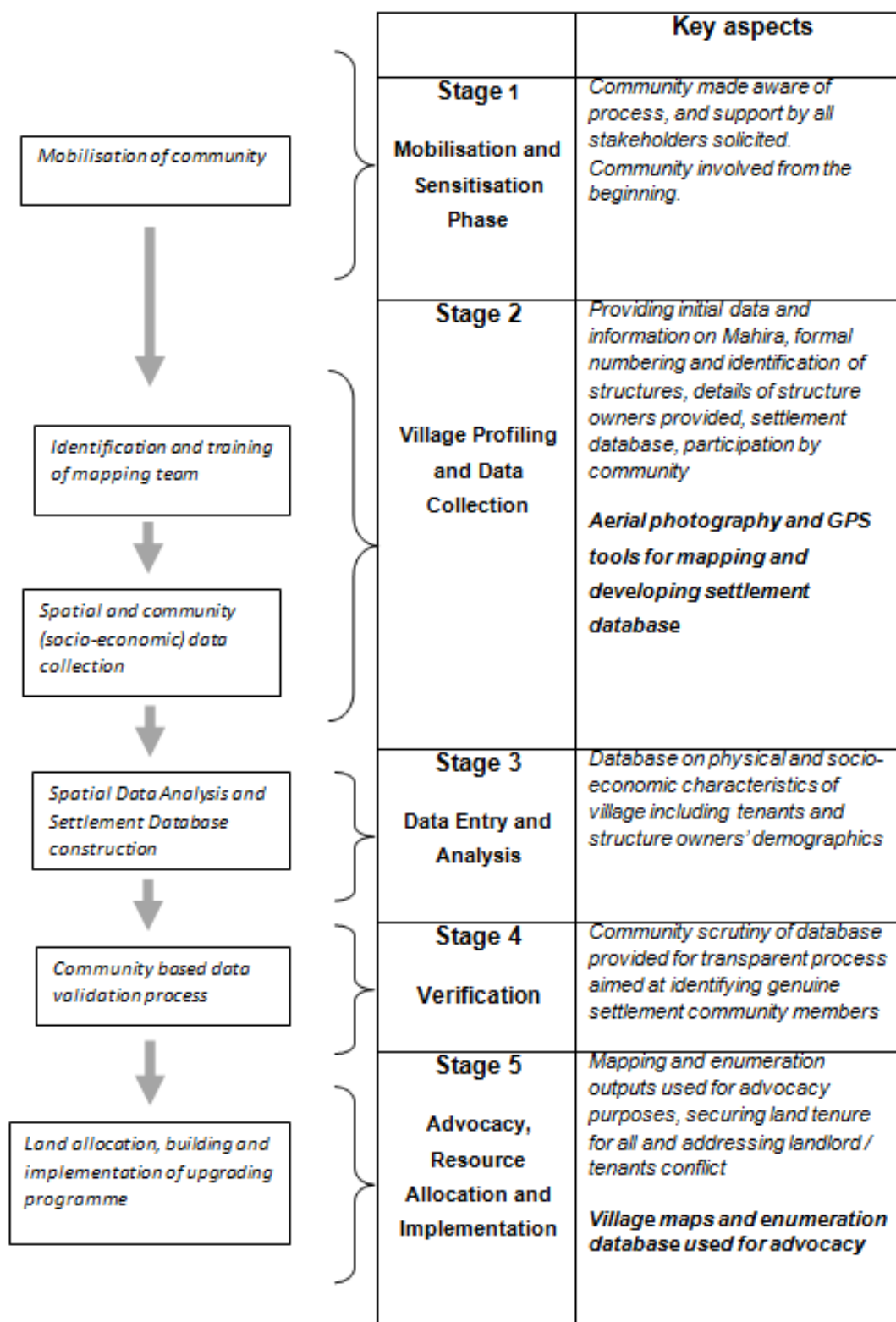


Figure 5-2 Upgrading process in Mahira Including the Integration of Geo-information tools

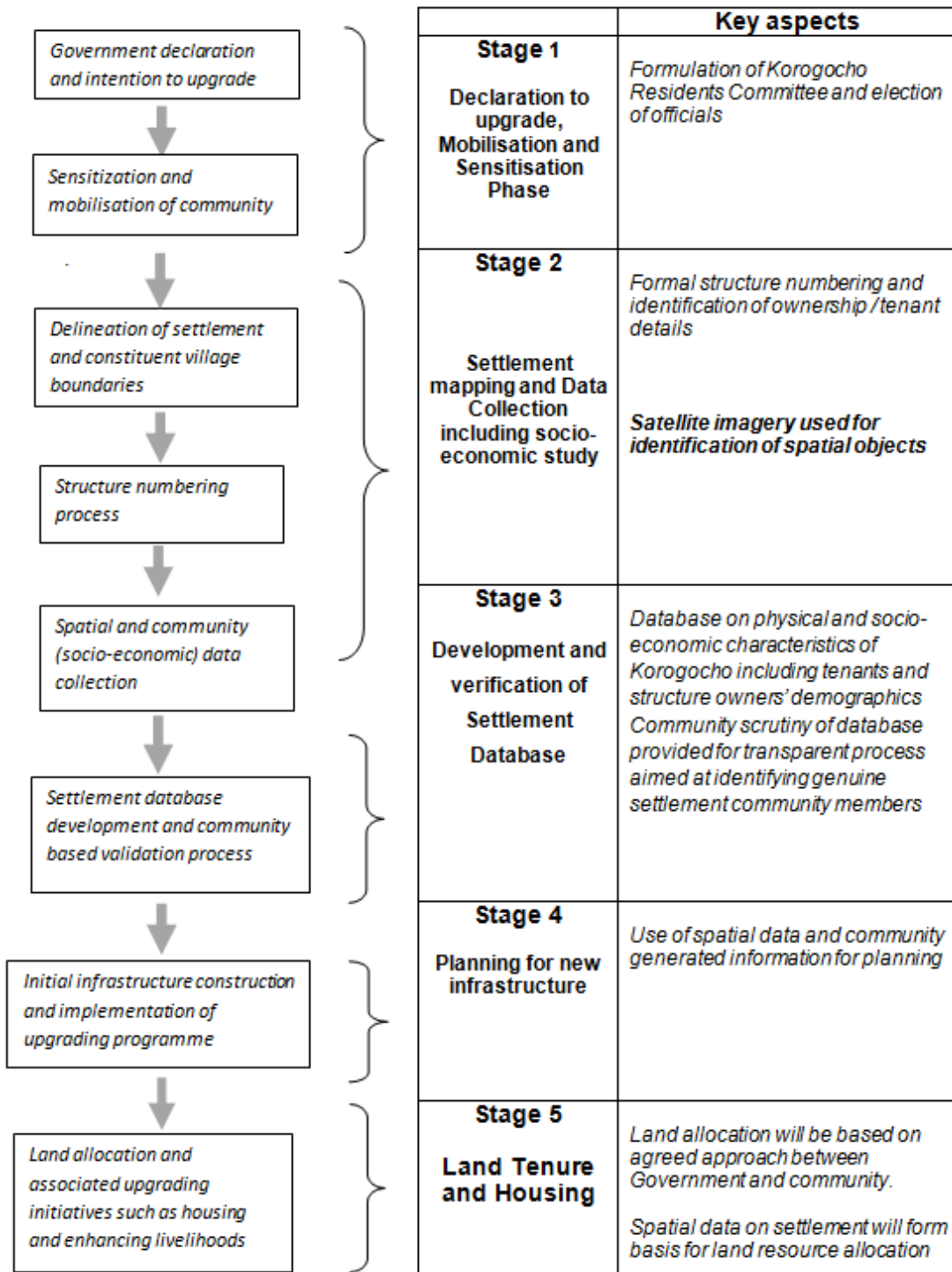


Figure 5-3 Upgrading Process in Korogocho Including the Integration of Geo-information tools

### 5.3.2 Geo-information tools - Application across epistemologies

Conventionally, GI tools represent static spatial or geographic objects and their attributes (Sheppard, 2001b; Dorling, 1998; Openshaw, 1991). Emerging paradigms have been developed with focus on people and their behaviour and are seen as critics of positivism (Kwan and Knigge, 2006). According to Pavlovskaya (2006: 2005), qualitative methods, have become an accepted strategy for those advocating non-positivist knowledge production and aspiring for emancipatory change. The documentation of informal settlements which are regarded as spatial entities is an important step in the upgrading process as observed in the previous section. Information regarding the settlements in this regard needs to be accurate and presenting the underlying challenges existing in the settlement in question. Accurate information is particularly valuable for policymakers and communities alike engaged in designing upgrading interventions and planning for service provision. Sliuzas (2003) and Acioly (2009), for example observe that the requirements for spatial information in the upgrading process present opportunities for the adoption of GI tools.

Within the mapping process in Mukuru, communities were required to identify areas which they thought presented risks and hazards as well as areas they perceived as having potential for development of new infrastructure. The identification of areas perceived as risky or posing danger to the community relied on qualitative information generated through personal experiences and living within the settlements. These could be areas where anti-social behaviour such as mugging was common, illicit brewing of alcohol or drug dens. The spatial models developed contained areas of threats and opportunities as well as existing water and sanitation facilities (**figure 5.4**). A corresponding database consisting of attributes of existing facilities was provided. The maps provided a visual model regarding existing water and sanitation conditions and formed the basis of designing interventions in future. Table 5.1 presents the attribute data collected for the spatial objects and areas perceived seen as threats and those with potential opportunities for new infrastructure.

Coloured stickers were used to represent different facilities mapped in the settlement. They were placed on the approximate location of facilities. The Google images provided a good background to the setting and using local knowledge as well as field verification, the community was able to create good visual models which were used to support decision making during the community action planning phase.



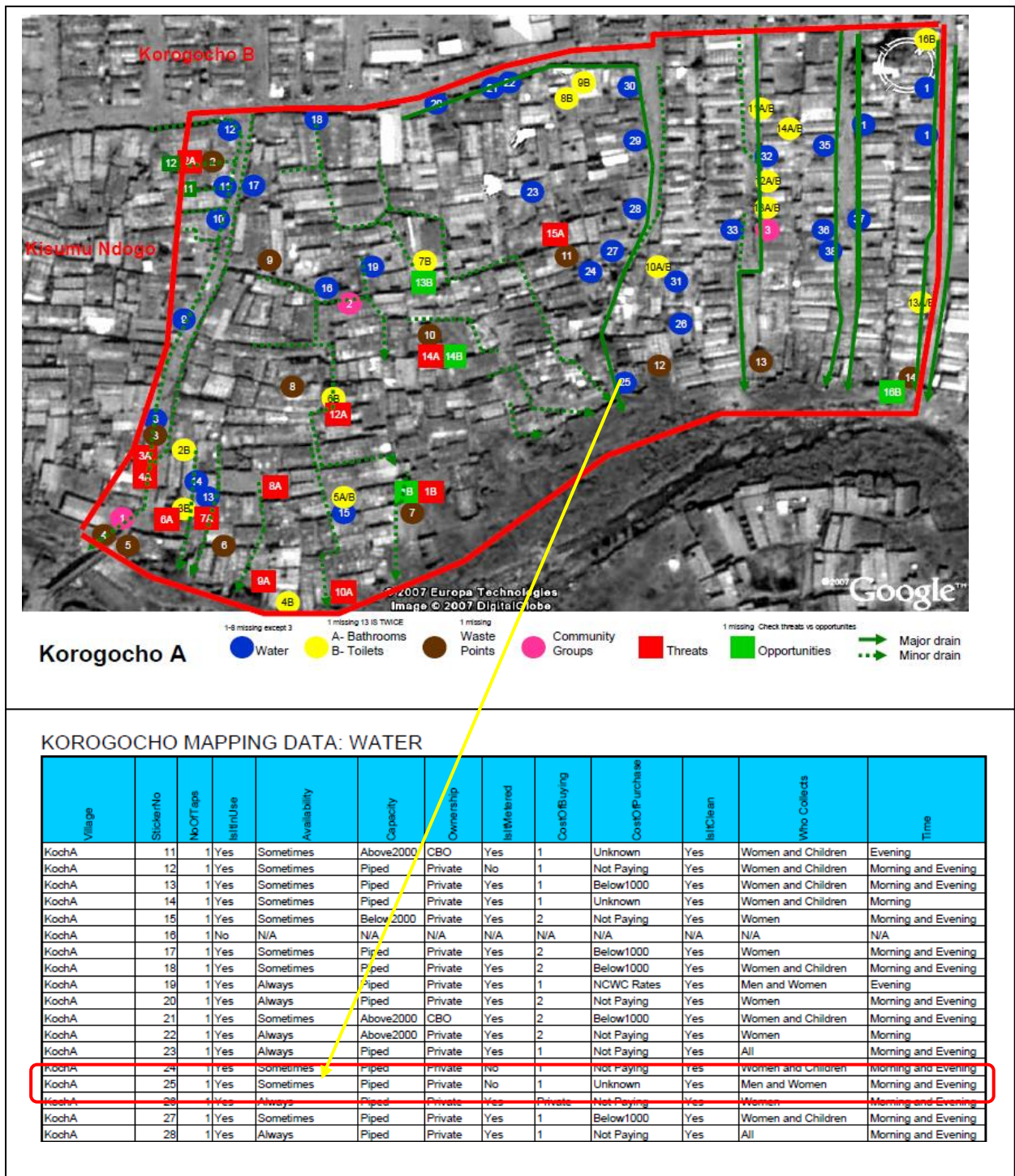







Figure 5-4 Google Earth Image Model and Databases Showing Mapped Infrastructure

Source: Goal-Kenya (2007) Unpublished Report

**Table 5-1 Attribute Matrix and Corresponding Labels**

Variable	Sticker	Attribute data collected
Water	Blue 	Spatial location and unique identification for each entity, number of taps, is it in use, availability (hours when there is water), water storage capacity, ownership (private or public), metered or not, cost per litre, cleanliness, users (gender/age/status etc.), what time of day is most water collected?
Latrines and Bathrooms	Yellow 	Spatial location and unique identification for each entity, composition (number of cubicles for washing, number of cubicles for latrine), public use/private, is it in use?, condition of structure, state of cleanliness, ownership, who built it? Responsibility of maintenance, disposal mechanisms, cost of accessing the facility, number of users (gender, age group, status)
Drainage	Green solid lines	Spatial location and unique identification for each entity, type of effluent running in the drains, responsibility of maintenance, who constructed the drains, where they discharged, drainage lining material, blockage
Solid Waste Disposal	Brown 	Spatial location and unique identification for each entity, responsibility for waste site management, groups involved if any and their competence, disposal charges, collection by city council authorities, waste constitution, final dumping point / destination, volume of waste dumped
Community Groups	Pink 	Spatial location and unique identification for each entity , group identity, activities, goals and objectives, composition and membership, structure
Relevant Opportunity /Threats	Red/Green rectangular 	Spatial location and unique identification for each entity, Opportunities (green) may include an area of land that could be used for an environmental health intervention or a project that has been started but not completed. Threats (Areas of muggings, illicit brewing or areas that are particularly dangerous for children, or a community asset that faces being closed down)

In Mahira, surveying the village using Global Positioning Systems (GPS) tools enabled Pamoja Trust and the community to present the actual spatial extent of the village. In essence this is the first step in quantifying the spatial extent of the village. The output from the surveying exercise were crucial in the final analysis when it came determining how much land each resident was entitled to. After the survey, the area occupied by the village was quantified as approximately 0.5 hectares (96m X 54m). Although the settlement boundaries were not officially recognised by the government or The City Council of Nairobi, the community was able to identify what they believed defined their settlement and put it on the map. The use of GPS tools enabled the community to translate their knowledge into a quantifiable variable which was used to develop a settlement map (figure 5.5 and 5.6). The models were later used by the community to seek to secure

tenure from the City Council. This is supported by Pavlovskaya (2006) who observes that qualitative methods play an equally important role for non-positivist knowledge production to support emancipatory change.



Figure 5-5 Google maps model of Mahira village (Google image 2009)

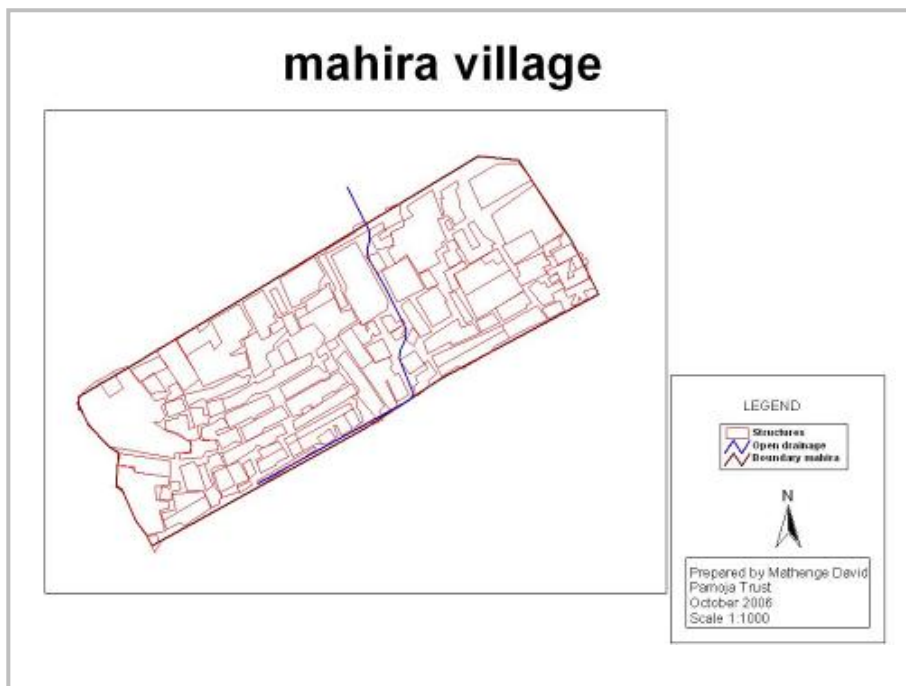
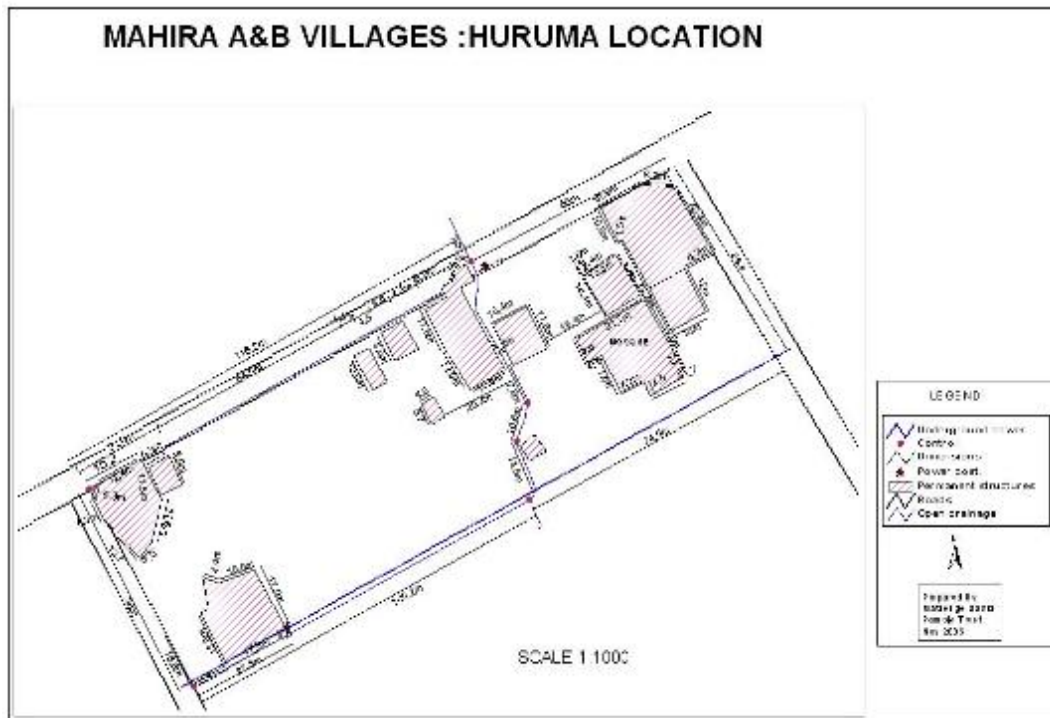


Figure 5-6 Mahira village; Structures delineated from 2003 aerial photography



Source: Pamoja Trust, Unpublished report

**Figure 5-7 Survey map of Mahira generated using GPS coordinates**

The structure numbering and enumeration process which was used to collect information on existing structures and demographics resulted in accurate and better data regarding the setting. More importantly it enabled residents to get to know their neighbours and the entire village. The participatory nature of enumeration enables residents to develop trust between residents and other stakeholders supporting them in the process according to the Global Land Tool Network (2010). Using the outputs from the mapping and enumeration, the community was able to resolve the issue of land allocation. Both tenants and landlords were allocated equal parcels of land irrespective of how much they owned earlier. Allocating tenants and landlords equal parcels of land was disapproved by the later although they were later convinced and were contented with the results. As observed by a Pamoja Trust project officer;

*“enumerations provide the means by which data are gathered to allow for local planning but also the process by which consensus is built and the inclusion of all residents negotiated” Mathenge, Pamoja Trust staff ( 24<sup>th</sup> August 2009)*



In Korogocho, the use of a satellite image model enabled the community to identify spatial objects such as structures and roads on the ground. Using the image provided, each spatial object was identified and digitised (**figure 5.8**). Each structure on the image was given a unique identification number which corresponded to what was on the ground. A corresponding settlement database which details such ownership, number of rooms, type of building material and demographics was developed using information collected by the community. Additionally, the image provided was used to update new structures and infrastructure constructed.

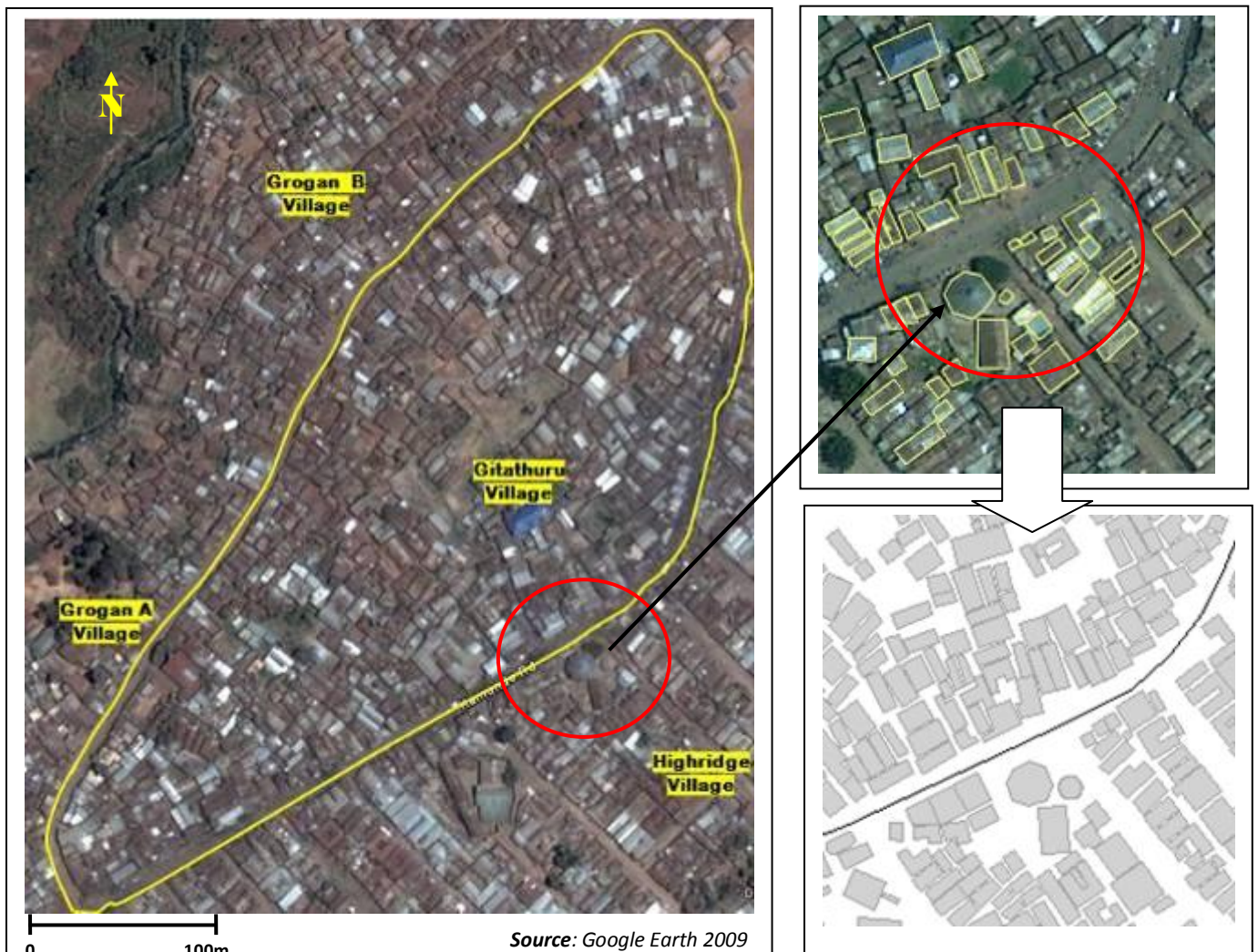


Figure 5-8 Feature extraction process

### 5.3.3 The Actors / Agents

Besides the community, the upgrading processes are supported by NGOs and CBOs who play an important role. These agents are able to contribute towards needs identification,

mobilize and organize community participation. Faith based organisations for example, can play a consensus building role while the settlement / community leaders organize and rally residents behind the upgrading project (Milbert, 2006).

It is evident that communities may lack some essential technical skills, which justifies the support by organisations especially in mapping and enumeration activities. Additionally, NGOs and CBOs are able to negotiate with local, provincial and federal government representatives and agencies (Huchzermeyer, 2009a; Hasan, 2006).

The involvement of Goal-Kenya and Pamoja Trust is in line with the enabling approach within upgrading programmes. This approach was introduced after government led efforts in upgrading and other social programmes were reduced under the structural adjustment programme (SAP) (Hilson and Potter, 2005; Burgess et al., 1995). Non government organisations play a key role in development initiatives and also serve as intermediaries between aid institutions and local communities. The enabling approach as applied to upgrading was primarily to build the capacity of local communities to participate in decision making processes and decide on resource allocation to achieve economic and social goals of slum improvement (Hilson and Potter, 2005). Goal-Kenya also supported the construction of new infrastructure (**figure 5.9**) to help address existing environmental health challenges identified by the community. In Korogocho, UN-HABITAT and the Kenya-Italy Debt for Development Programme (KIDDP) have partnered to support the upgrading process. The integration of GI tools within the upgrading activities is attributed to these organisations. The communities within the settlements lack the technical skills and know-how to apply the tools which explains the support by the organisations. The organisations may be aware of the inherent advantages of integrating GI tools within the upgrading processes. However, this raises questions regarding ownership of the process and the resulting data and information. In section 6.9, the issue of information ownership is discussed where questions are raised on whether the community own the data and information despite not owning the GI tools.

The mapping of water and sanitation facilities in Mukuru enabled other agents to use the outputs for decision making regarding improvement of the environment. These included ; The City Council of Nairobi, National Environment Management Agency (NEMA), Constituency Development Fund committee (CDF), University of Nairobi, Government ministries (Health, Provincial Administration, Children's department), African Population

and Health Research Council (APHRC). NEMA for example used the information to remove toilets which discharged waste into the Ngong River. The CDF was able to support the installation of new water tanks in areas where residents did not have adequate supply.

Chiefs and settlement elders oversee all development initiatives within their areas of jurisdiction and are regarded as gate keepers in this regard. The Chief in Mukuru took the initiative to inform the community through a local *baraza* (meeting) of the intended project by Goal-Kenya. In upgrading projects, political good-will and local community participation are regarded as key if upgrading is to achieve its objectives. The Chief uses his position to ensure all initiatives are granted his approval before commencement. This ensures control over resources, developments and other activities within the village<sup>9</sup>.



Figure 5-9 Sanitation block constructed in Mukuru

The community in Korogocho has established the Korogocho Residents Committee (KRA) through which their needs and aspirations are communicated to other project partners and the government. The committee consists of men, women, youth, tenants, landlords and the area Chief. The committees may be regarded as important agents given

<sup>9</sup> The Chief is the lowest position in the Government administration hierarchy. Chiefs are responsible for locations and report to the District Officer. Their influence over the matters in areas they control is great as they have 'power' to sanction activities. See also COHRE (2007), Kenya - Right to Housing and Water (Article 11(1))

that they are mandated to carry out settlement mapping and related activities such as structure numbering. However, this carried out with the support of government officials to ensure transparency and accuracy of the data collected.

#### **5.3.4 Sectoral and Comprehensive Mapping Processes**

Mapping not only helps communities to identify resources and obtain geo-spatial information, but also helps them to learn how to express their needs and priorities with a view to addressing them. Planning and upgrading involves determining appropriate decisions and actions through a series of choices. Making choices requires, in addition to planning, through planning and comprehensive information including spatial information about the past, present and where possible, the future. Two distinct approaches to the integration of GI tools in the upgrading process were observed in the case studies. Within Mukuru, a sector-based approach was used, in which the tools were applied to help gather information on specific aspects within the settlement. Data was gathered mainly on environmental health issues including water and sanitation. In Korogocho and Mahira, a comprehensive approach was applied, in which GI tools were applied to provide data on all aspects of the settlements, including social, cultural, economic and physical elements.

##### *Sectoral Mapping*

The focus is usually on collection of data and related attributes about a single sector or issue within a community, to assist in planning for interventions. Within Mukuru, GOAL-Kenya initiated an environmental and sanitation project where the objective was to improve the water and sanitation situation. The process, which was initiated by GOAL-Kenya, was tied to the organisation's development and assistance programme, which focused on water and sanitation. This indicated that funds and resources were allocated to address a single issue; environmental health. This did not imply the lack of other challenges facing Mukuru residents. The process entailed the involvement of the community in helping to collect data regarding this sector. In the Community Action Planning phase, the community and other stakeholders were involved in deliberating on solutions and the prioritisation of activities to address environmental health challenges.

Although data was collected regarding environmental health aspects within Mukuru, the information generated enabled other organisations like the NEMA and City Council to address further environmental health challenges. NEMA, for example, was involved in the



removal of toilets polluting the Nairobi River, while the City Council unblocked drains and identified and allocated open spaces for dumping purposes. Criticisms have been levelled against sector-based approaches where these are seen as not supporting or fully integrating with city-wide development agendas (Sen et al., 2003:597). The sector-based mapping approach within Mukuru did not take into account the Nairobi City development agenda, but was instead focused on a small area and community with the aim of addressing existing challenges.

### *Comprehensive Mapping*

Comprehensive or multi-sectoral mapping addresses all major aspects of upgrading and planning within a settlement. The upgrading process within Korogocho, which is supported by the Kenyan and Italian governments, aims to address land tenure and physical infrastructure improvement. This comprehensive approach will target multiple sectors and engage in more than one project, to ensure that residents get secure tenure and improved infrastructure. Data relating to the following aspects was mapped: parcel owner and tenant details, household unit details, structure details and parcel details. With regard to linkages, the upgrading programme is closely linked with the national and City-wide settlement upgrading programme. The government of Kenya has earmarked Korogocho and other settlements within Nairobi and larger cities for upgrading in the Kenya Slum Upgrading Programme (KENSUP). The comprehensive approach of data collection supported by GI tools is being applied to produce uniform and comprehensive data for planning and upgrading. The substantial time and financial resource requirements necessitate government or donor support to facilitate the process.

A comparison of sectoral and comprehensive approaches is provided in Table 5.8 where aspects like community engagement, actor involvement, data requirements and GI tools and resources are examined. It is evident that while comprehensive mapping approaches offer a better analysis of the multiple challenges facing informal settlements, sectoral and small-scale mapping approaches offer better platforms for engaging communities. The lower level of resources required for facilitating smaller mapping initiatives is ideal in resource-poor initiatives and settings.

**Table 5-2 Comparison of Sectoral and Comprehensive Mapping Approaches**

Comparison of Sectoral and Comprehensive Mapping Approaches		
	Sectoral (Mukuru)	Comprehensive (Mahira and Korogocho)
Community Engagement	Better engagement of community owing to small-scale operation	Complex and large-scale operation offers little interaction with community
Actors	Single organisation: GOAL-Kenya	Multiple actors: Ministry of Local Government, Ministry of Lands, UN-Habitat, Italian Government, Faith-based organisations
Data	Environmental health	Physical, socio-economic, structure ownership and tenant details, infrastructure availability
Geo-Information Tools	Google Earth tools (free internet based and accessible tools)	Aerial photography and satellite imagery (Expensive to acquire)
Resources	Less time required to map environmental data. Low financial requirements compared to comprehensive mapping activities	More time required to map all aspects of community. Immense financial requirements

## 5.4 Shaping Power Structures, Relations and Political Processes

*Maps are not just neutral pieces of paper with lines drawn on them. They are powerful documents that are used for a variety of political purposes. This being the case, one must anticipate possible sensitivities on at least two fronts: among the communities being mapped and with government authorities. People in the communities will be suspicious of the project and traditionally suspicious of outsiders. They don't know who will control the maps when they are finished. People in government will often, if not always, see community mapping as a potential threat, as part of a campaign for land rights and empowerment. (Chapin, 2006:95).*

Devas (2001) maintained that for upgrading and planning processes to meet their goals, it was important to bear in mind the following;

1. Ensuring political processes are inclusive, where even the voices of the poor are heard and have influence;

2.The capacity of city governance institutions are enhanced to meet the needs of the poor;

3.Civil society is supported in its role of enabling the poor to exert influence and achieve access and benefits.

Gulyani and Bassett (2007) observe that upgrading programmes should adopt a community-led or demand-led approach, in order to encourage community inputs and interactions. Governments therefore need to collaborate with and leverage different civil society organizations. The need to have communities, for example, determine the management of upgrading processes and ensuring regulations and by-laws are followed in order for programmes to succeed, demonstrates the importance of power and control over the process (Luna et al., 1994:97). The notion of better government as opposed to less government has been put forward as a result of upgrading experiences in Latin America (Soto, 1989).

#### **5.4.1 Democratising information (ownership and appropriation)**

Roy (2005:152) presents a policy epistemology which stresses that the provision and distribution of infrastructure is not a technical issue but rather a political process. It underscores the importance of a different set of experts namely the residents of informal settlements who play an important role in making it possible to generate knowledge about upgrading and infrastructure. These ideas reiterate that the upgrading of informal settlements is a politicised process with importance attached to resources and power and having control over them.

The community members collect and therefore own the information about their settlement, which can be crucial when they negotiate with officials for amenities or when evictions are threatened (Joshi *et al.*, 2002). In the Mukuru and Mahira upgrading cases, community involvement through the different stages was more evident in comparison to government involvement. In Mukuru, Goal-Kenya and the community took the initiative to address the poor water, sanitation and environmental challenges within the settlement. However, the government was represented through the area Chief, especially where permission was to be given to carry out the process. Subsequent stages of the upgrading which involved training of enumerators, data collection and analysis, were managed by the community and Goal-Kenya.

The process of deciding which projects to implement, and where, was not entirely controlled by the community and Goal-Kenya. Some of the resources and authority were vested in government ministries and the area Chief. In Mahira, the initial resistance exhibited by the area Chief and elders may be interpreted as turf protection. During the verification stage of the upgrading process, the role of the Chief was recognised, given that the register of plot owners was displayed in his office for all to review in ascertaining the ownership of structures. The community elders also maintained a separate copy, which meant that the Chief or other persons could not alter the details.

**Breaking the bonds:**

*“Without Pamoja Trust involvement, we would be at the mercy of the City Council and Chief. The Chief could easily declare a resident as a dissident and therefore not wanted in the village and have their structure demolished.”*

**Information is empowering:**

*“After enumeration we knew tenants were more than landlords, therefore during negotiations with City Council, we presented the case of residents, not tenant or landlord.” Joseph Njoroge, Mahira village elder.*

The upgrading process in Korogocho had significant government involvement due to the fact that it was a bilateral agreement between the Kenyan and Italian Governments. In the past, the upgrading process in Korogocho had witnessed many conflicts over the most appropriate land tenure system, with landlords and tenants all demanding their rights. Despite the heavy involvement of the government, the process integrated community participation and ownership from the start. The Korogocho residents' committee was elected to oversee the process with the assistance of the Ministry of Local Government and UN-Habitat. Through the residents' committee, the community, for example, organised the demolition of structures to pave the way for road expansion, and carried out the socio-economic survey and enumeration process. Because they were managing the stages of the upgrading process, it was hoped that the community would feel in control and thus support the upgrading programme. However, some landlords have shown resentment and raised fear of losing their property in the process. Regarding the land tenure issue, the community's involvement in the verification of ownership and tenure assured transparency. The enumeration of tenants and structure owners provided an

opportunity for the community to acknowledge genuine residents and lock out *outsiders* who might want to benefit from the process. The final decision about the appropriate land tenure system and upgrading of infrastructure, however, remained with the Ministry of Lands and Settlement which was prepared to take into account community views and suggestions.

#### 5.4.2 Access and Participation

It is important within upgrading processes to have an institutional and organizational setting through which the participation of target groups can be facilitated, and partnerships between public, private and community stakeholders can be realized (Acioly, 2007:7). Similarly, community participation and support is essential, since without it upgrading is difficult, if not impossible.

Goal-Kenya made Google Earth models of Mukuru available to the community. They in turn used these for mapping water, sanitation and environmental conditions. Without such spatial information it would be difficult for the community to map or describe the condition of the existing infrastructure. Making the spatial data available enabled Mukuru residents to participate in mapping the infrastructure in their settlement. In the case of Mahira, the community was not able to advance the agenda for secure land tenure without sufficient data and information showing the extent of the village and what existed within its boundaries. The village elders used the spatial information available as an advocacy tool to negotiate for the land occupied by the village, as expressed by a resident from Mahira in one of the focus group discussions:

*“Before this (aerial photography of 2003), all maps showed no settlement existed on the ground. After 2003, the aerial photos revealed that there were people on the ground, therefore the Nairobi City Council officials knew we were informed of the current situation on the ground.” Mahira resident, March 2010.*

In the case of Korogocho, the residents’ committee and enumerators would not have been able to participate effectively in data collection and enumeration exercises if a base map showing all spatial details of the settlement had not been provided by the Ministry of Local Government. The committee was encouraged to ensure accurate data was

captured regarding ownership. Participation was prompted by the availability of a good base for collecting data and by the end goal, which was security of tenure.

The National Environmental Management Agency and other Government agents took appropriate measures to improve on environmental conditions in Mukuru, since they had access to the outputs of the mapping exercise. Access to up-to-date information on drainage conditions in Mukuru enabled the City Council to embark on unblocking the drains that served the village. The lack of information regarding challenges in settlements makes it difficult for agencies to take appropriate action to address them.

#### **5.4.3 Horizontal and Vertical Linkages**

Linkages – whether vertical or horizontal – within upgrading processes are important in facilitating communities rights to act, organise and make demands. In slum upgrading projects in Dar-es-Salaam, Tanzania, linkages made people aware of their own capacities and resources, potentially helping to increase the options available to them (Kyessi, 2005). Experiences in Thailand have shown that through networks, communities can share their experiences, learn from each other, work together and pool their resources (Boonyabancha, 2005). In relation to the application of GI tools in upgrading processes, Glockner, *et al.*, (2004) for example, observed that in community mapping initiatives the information gathered helped to link the vertical and horizontal planning processes. Through participatory activities, information was gathered to support the vertical planning process through locally based organisations working with communities. Similarly, this information was used to communicate the needs and challenges facing communities to higher authorities.

In Mahira village, the mapping and enumeration process enabled the community to generate information regarding their status and demographic details. This information was compiled into a village database, which was later used by the settlement committee in collaboration with the *Muongano wa Wanavijiji* organisation as an advocacy tool to secure land tenure. Actions and activities at the micro level (household level) led to the generation of information which facilitated vertical linkages with authorities – in this case the Nairobi City Council. Horizontal linkages were created between various settlements carrying out mapping-related activities under the umbrella of *Muongano wa Wanavijiji*. The Pamoja Trust facilitated Mahira residents to visit Indian and South African urban poor federations' programmes, where similar undertakings were in process or had been

accomplished. These visits exposed Mahira residents to local and international best practice. In the process, new networks and linkages were created between the communities and involved organisations.

In Mukuru, the mapping of water, sanitation and environmental conditions in the settlement generated data and information which was compiled into models used to communicate with stakeholders during the community action planning stage. At the micro level, households provided data regarding infrastructure status, which resulted in a better understanding of their environment. At the macro level, GOAL-Kenya was able to meet and address these challenges with the relevant Government Ministries, taking the necessary action, such as providing new facilities or facilitating the unblocking of drains.

Within Korogocho, households are located within a specific village, managed by a village committee. Mapping structure details and presenting these for verification by the community enhanced linkages between households. Each village in Korogocho is represented in the residents' committee, which in turn communicates with the steering committee. The steering committee is composed of community representatives, government officials and faith-based organisations. The steering committee links with UN-Habitat, the provincial administration and Government Ministries at the macro level, where resources are made available for upgrading (**figure 5-10**).

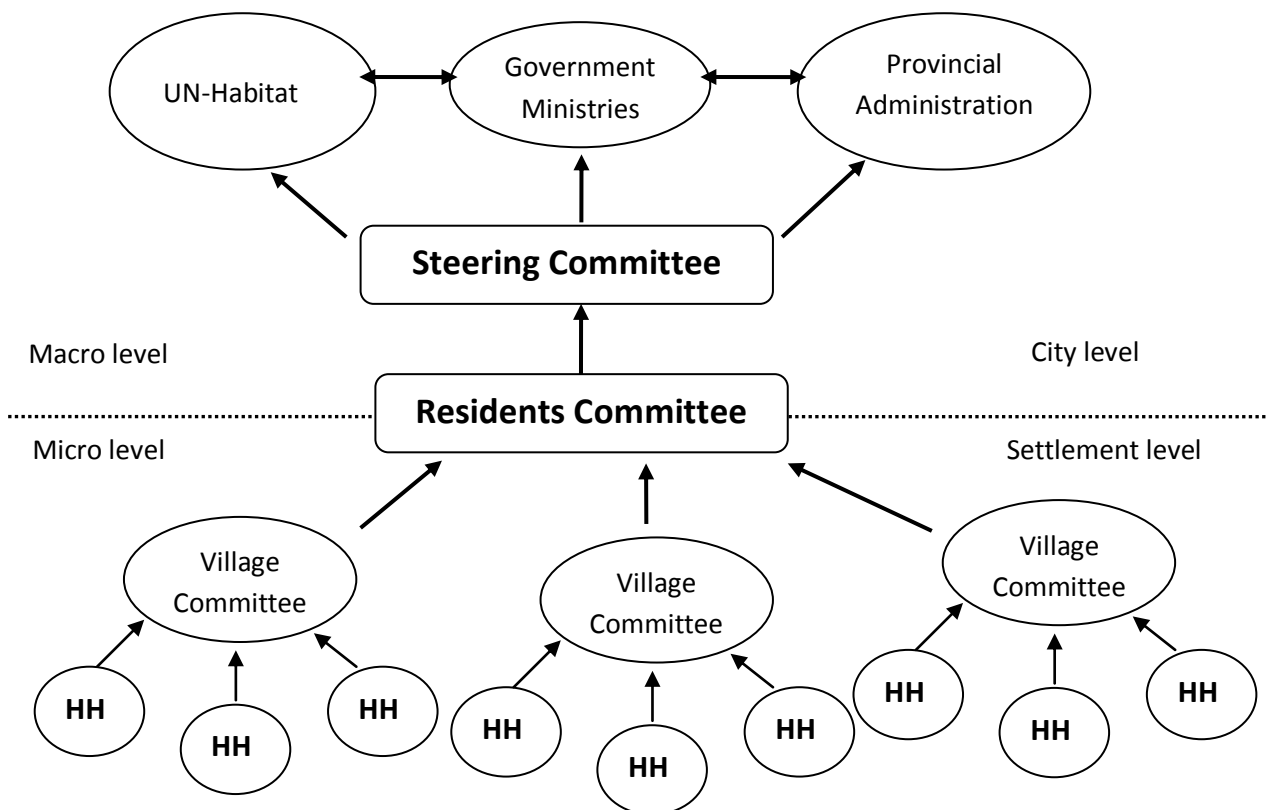


Figure 5-10 Linkages Formed at the Micro and Macro Levels

#### **5.4.4 Mapping and Enumeration as Conflict Resolution tools**

Conflicts within upgrading processes have the potential to complicate the implementation of upgrading and service delivery projects, leading to eventual abandonment and subsequent loss to beneficiaries (Otiso, 2003). In Kenya, conflicts have occurred between authorities and communities, especially when the former adopt top-down and un-participatory approaches to address challenges facing informal settlements. Coupled with the threat of losing livelihoods and social networks, communities within informal settlements have reacted in both violent and non violent ways in protest against unfair leadership (Huchzermeyer, 2009b; COHRE, 2005a). Weru (2004:48) observed that some structure owners, who in effect were absentee landlords, preferred to maintain the status quo to protect their interests and continue benefiting from collecting rents from tenants. Any effort to upgrade the settlement could potentially deprive them of benefits and would therefore be met with resistance.

Two forms of conflict were observed within the upgrading processes. These were conflict between leadership and communities; and tenant-owner conflict. Several reasons were identified by communities during focus group discussions regarding the source of conflicts within upgrading processes, as follows:

1. Protection of their control over the area by Chiefs/administrators
2. Control over resources, especially land
3. Fear of the unknown.

In Mahira, the upgrading process did not initially receive support from the area Chief, owing to fear of loss of control over the community. Before the upgrading process, the area Chief controlled all development within the settlement, which meant anyone wishing to improve or build a new structure needed to seek consent from the Chief. Enumeration and subsequent upgrading meant the community would be empowered to manage all matters within the settlement. After mapping the settlement, it was resolved that the available land should be equally allocated to tenants and owners alike.



### *Impact of mapping*

Enumeration and mapping meant that tenants and landlords were treated as equals and that the land would be divided equally among the residents. The process led to the resolution of long standing tensions between landlords and tenants and facilitated resource allocation and equality. Some of the residents' sentiments are presented below:

*“Enumeration and mapping helped us determine who would benefit from the land and housing project. The community were urged to accommodate each other and be content with land allocated to them after the subdivision... everyone was treated as a resident and not tenant or landlord.” Mahira residents.*

Upgrading brings local stakeholders together, helping to build trust, encouraging innovation, promoting the creation of social networks and contributing to conflict resolution (Majale, 2008). In Korogocho, tension between structure owners and tenants mainly revolves around land. The tenants claim equal rights to the land, referring to a Presidential directive in November 2000, which they claim included them in the settlement in Korogocho. Structure owners resisted upgrading and related processes, claiming the potential loss of their property and land. The revelation and documentation of structure ownership was initially treated with suspicion by structure owners, who had for long enjoyed their status without public interference.

## Slum dwellers in Nairobi to benefit from housing

SHARE BOOKMARK PRINT EMAIL RATING ★★★★★

By NATION Reporter  
Posted Thursday, June 4 2009 at 21:56

More than 100,000 slum dwellers will benefit from a housing project in Nairobi's Eastlands area. Dubbed 'Slum Upgrading Programme', the project launched on Thursday will benefit residents of Korogocho slums and later be extended to other areas in the city.

However, there was a standoff between landlords and tenants over the ownership of the yet-to-be-built houses. Currently, residents of the slums live in structures made of temporary materials such as poles, sacks, cartons and polythene. The slum upgrading project is being funded by the governments of Kenya and Italy.

**Source:** The Daily Nation Thursday, June 4 2009

### *Impact of mapping and enumeration*

The structure owners, under the umbrella of the Korogocho owners' welfare association (KOWA) and the Korogocho residents' association (KRA), have since agreed to the continuation of the mapping and structure numbering task of the upgrading process. The outputs from the mapping will ensure all structure owners, as well as their tenants, are known. Both KOWA and KRA are represented in the mapping and enumeration process. The final verification of the outcomes by the Korogocho community has resulted in support and faith in the system. As a show of support for the process by structure owners, all structures mapped as having encroached onto the road reserves were removed, to pave the way for new roads in Korogocho.

*"People and structure owners did not doubt the outcome of the mapping of roads [...] the process has reduced mental torture since the map has shown the path to upgrading."* Secretary, Korogocho residents association.

## **5.5 Barriers to Effective Use and Integration of GIS tools**

*Community based GIS is a reflection of the politics of the builders and the users of such systems, although these politics extend beyond the local impacts on participating and non participating communities.* (Craig, Harris and Weiner 2002:12).

The effective use and integration of GIS as planning tools are dependent on factors like institutional and organizational capacity and capacity building. Other factors include governance, leadership, organisational missions, institutional inertia, resources (financial, technology, and human), tenure/maturity of the organization, services offered, and communication, attitudes toward embracing new technology or ideas (Elwood, 2006; Roman and Moore, 2004; Ramos, 2001; Ramasubramanian, 1999). Another barrier is the lack of effective administrative mechanisms and structures through which decisions reached in community and participatory GIS applications could be monitored and executed (Rambaldi *et al.*, 2006b: 6). The lack of training hinders planners and communities alike from exploiting the full potential of GI tools (Göçmen and Ventura, 2010:176).

*“We are old and we do not know how to make maps, read and write, therefore Pamoja trust officials helped us draw the village map to present to the City Council.”* Mahira village elder.

The lack of knowledge on how to use and interpret remote sensing data such as Google Earth models was expressed during the focus group discussions. In many of the settlements, there was predictably low access to information and communication technologies, including access to internet facilities. The settlement elders in Mahira and Korogocho expressed their limited ability to interpret satellite imagery. In contrast the youth in Korogocho and Mukuru who took part in the mapping and enumeration exercises were able to orient well and identify structures on the ground after initial training. Local knowledge proved useful in mapping exercises, as expressed by a participant from Korogocho:

*“We live here; therefore we know the areas well. We know what is where within Korogocho.”* Peer educator and enumerator, Korogocho.

Regarding the issue of priorities and the availability of trained personnel to manage Geo-information-driven activities, the City Council of Nairobi did not have sufficient personnel or even a department dedicated to mapping where GI tools would be in use. To add to this, the Council did not have it as a priority to map informal settlements within the city because it was an expensive and time-consuming project.

*“The involvement of Pamoja Trust was very important. Initially we were not able to penetrate Nairobi City Council and make progress. Had we waited for the City Council, we would be nowhere... the City Council is very slow.”* Elderly woman resident of Mahira village).

The resistance to mapping and enumeration has been discussed elsewhere in this thesis (see Section 5.4, Shaping Power Structures, Relations; Political Processes). The resistance by area Chiefs who feared losing their grip or control over the village on the one hand, and resistance by structure owners due to the fear of losing their properties, may be categorised as barriers to implementation and the use of GIS in this context. The GI system supporters and users were pitted against the local political administration and structure owners in an effort to protect local interests. Local politics and tensions between structure owners and tenants in Korogocho have led to the delay and sabotage of

mapping and enumeration efforts, for example, those of the Pamoja Trust, as observed by Weru (2004).

## 5.6 Ethical Issues in the Integration of GIS tools

The integration of GIS tools in upgrading and planning processes raises ethical questions regarding the users, including the communities involved. GIS integration should not among other things, harm people involved in using it, nor distort reality by presenting false information, neither should it appropriate other people's intellectual output (Blakemore and Longhorn, 2004; O'Looney, 2000). Blakemore and Longhorn further stressed the need to maintain the privacy of data sources by making the identity of subjects anonymous. Maintaining the confidentiality and anonymity of communities or persons directly involved in GIS is central to the question of ethics in GIS use (Brown, 1993:195). Avoiding infringements of privacy that could occur in spatial data collection, as well as the need to obtain informed consent and not provoke tensions or violence in a community, are regarded as important ethical issues (Rambaldi *et al.*, 2006b).

The need to have communities' informed consent for participation in research or investigation is important (Behi and Nolan, 1995:713). Communities need to be given true and sufficient information to help them decide whether to support the processes or not. This implies that communities should have free and un-coerced choice to provide information and details about themselves and their areas. Diener and Crandall (1978), as quoted in Walsham (2006:327), identify four main areas of ethical concern namely: harm to participants, lack of informed consent, invasion of privacy, and deception.

### *Confidentiality and infringements of privacy by spatial data collection*

The mapping, enumeration and subsequent display and verification of structure ownership and tenant details in Mahira village may be regarded as infringing the confidentiality and anonymity of the persons concerned. Verification of structure ownership was opposed by some of the residents, who felt that it exposed their private information to the public. This explains why, for example, there was resistance by structure owners in the beginning. In Korogocho, the process of enumeration and mapping structures resulted in the development of a village-based ownership register which was subject to community verification. For a long time the structure owners details

were not disclosed, which ensured their privacy. However, the nature of the upgrading process required all structure owners to declare to their interests within the settlements.

The identity of structure owners in informal settlements has remained mysterious within Nairobi and other urban areas. Absent landlords or structure owners have been blamed for the poor conditions within the settlement, given that they do not reside within the settlements and are only concerned about the rent accruing from the structures. Some of the structure owners are influential people and leaders in society, which explains their resistance to identification.

#### *Tensions caused by spatial data collection*

As mentioned above, the process of spatial data collection led to the build up of tension within the settlement, especially in Mahira and Korogocho. Tension was observed between households, owners and authorities. Tension between households in Mahira arose in cases where structures were occupied by tenants. During enumeration, it was necessary to register the structures by individuals' names, which led to conflict over the rightful person to have the structure registered under them. Some tenants and owners were reluctant to provide identification to the enumerators, which resulted in the latter obtaining it from elders or neighbours. This process of providing details for unwilling persons led to tension between community members who did not approve of volunteering information and those who supported the enumeration process.

The authorities (City Council of Nairobi) did not formerly recognise the existence of Mahira settlement. All maps prior to the enumeration and mapping of Mahira indicated that no settlement existed on the ground. The resultant aerial photography, mapping and enumeration enabled the community to present a case for tenure regularisation by the City Council. This process of advocacy was not received well by the Council, who had earmarked the area for other land uses.

The mapping of structures that had encroached on road reserves within Korogocho was not welcomed, especially by those directly affected. Many of these structures supported commercial activities and provided livelihoods for many residents. The proposal to remove the structures to allow for road expansion was met with resistance by the owners, citing loss of livelihoods and for some, shelter.

In Mukuru, the mapping of toilets draining into the Ngong River led to their removal by NEMA which has the overall responsibility of ensuring that all development meets environmental standards. Using information from the mapping exercise to identify polluting toilets was met with protest by the communities affected. Although well intended, mapping led to actions opposed by the communities. This may be termed as unethical given that it resulted in tensions and left the community more vulnerable (with no sanitation) while providing no immediate solutions.

## 5.7 Synthesis

**Table 5-3 Synthesis (Actors, Upgrading Process and Geo-Information tools)**

	<b>The Community</b>	<b>NGO's</b>	<b>Government and International Organisations</b>
The Process (Data collection, enumeration, mapping, verification and implementation)	Project approval, data collection and volunteering information. Participated in project prioritising and verification of database. Provided labour inputs during construction of infrastructure. Consent and approval of projects had to be given by settlement elders. Settlement elders played role in decision-making and verification.	Facilitated mapping and enumeration process. Provided technical input for data analysis. Enumeration and mapping were part of organisation's programme.	Facilitation and approval of mapping and enumeration process. Provided technical input for data analysis. Enumeration and mapping are part of government and international organisations approach to achieve MDGs in informal settlements.
The Tools and Data (Geo-information tools, data source and usage)	Use of satellite & aerial images for mapping and enumeration. Provided household, village and settlement level data to develop database. Facilitated to acquire tools (GPS) by development partners to collect spatial data. Vetting of data and tools used.	Provided technical inputs such as satellite imagery, database software for analysis, GPS for spatial data collection. Trained local communities on the use of tools for spatial data collection.	Recognised role of Geo-Information and related tools to address challenges in informal settlements. Government provided physical and spatial data such as cadastral data. Vetting of outputs by government
Linkages (Vertical and Horizontal linkages)	Linkage between households enhanced during mapping. Mapping led to better understanding of their environment and provided information used to facilitate vertical linkages and decision making. Elders link community and development partners.	Networked with community and other organisations working to improve living conditions in settlements. Facilitated vertical linkages with government and city council.	Networking with NGO's working within settlements. Facilitated vertical linkages with other governments and international donors.
Conflicts (Tenant / structure owner / Administration)	Fear of loss of social networks and physical assets and relocation led to conflicts. Enumeration seen by some structure owners and tenants as a move to evict them.	Mapping and enumeration integrated conflict resolution approaches. Advocacy approach not well received by city council and Chiefs.	Need to safeguard government position led to conflict and opposition to advocacy efforts by settlement Chiefs and officials.

## 5.8 Conclusion

A synthesis of the key issues is presented in Table 5-3. Mapping the key upgrading steps enabled the research to understand how, when and associated effects of integrating GI tools in settlement upgrading processes. It emerges that the upgrading processes explored in this chapter have political underpinnings, defining power structures and relations within the settlements. Integration of GI tools, for example, empowered communities and led to the emergence of new relations within and between actors including communities.

From the conceptual framework presented in Chapter 2, it is clear that informal settlements face challenges such as lack of basic infrastructure and poor environmental conditions. To address these challenges, external actors such as non-governmental organisations and resident communities collaborate to meet development and upgrading objectives. From the onset it should be noted that the key drivers of this process are mainly the external actors and not the communities *per se*. Goal-Kenya, the Pamoja Trust and UN-Habitat provided the spatial data and resources for implementing the upgrading programmes. This may lead to questions regarding ownership and meeting real community needs. Mapping of water and sanitation facilities in Mukuru for example was initiated by Goal Kenya in line with its (Goal-Kenya) programme objectives. This may not have necessarily been the most pressing need facing Mukuru residents. Integrating GI tools in settlement upgrading processes may be to serve specific interests of the external actors, which in this case aimed at addressing challenges facing the settlements.

Open sources of spatial data such as Google Earth provided access to previously unavailable data. Despite the existence of open sources of data, communities living within informal settlements may not be able to access them easily, owing to lack of appropriate tools and internet connections. The tools provided appropriate platforms for communities to appreciate their environment, and subsequently to participate effectively in planning and decision-making processes. The training of communities by NGOs to use GPS tools for data collection and to interpret satellite or aerial photography spatial data provided an opportunity for communities to control and vet information obtained regarding their settings. This is an important element if communities are to support interventions within settlements.

Integration of GI tools in upgrading processes led to the development of horizontal and vertical linkages which did not exist before. Mapping and enumeration led to horizontal linkages where residents were able to know their neighbours and settings better. Vertical linkages were created in the case of Mahira, where residents approached higher authorities (Government and City Council) to negotiate for land tenure. Information as demonstrated in these cases empowered communities to communicate with other actors within and outside their setting, as well as to participate effectively in decision-making processes aimed at improving their settings.

Mapping and enumeration activities as demonstrated in this case led to the empowerment of settlement communities. Information generated from these activities led to enhanced knowledge of residents regarding their own settings. In Mahira, for example, the residents used this information to campaign for secure land tenure from city authorities. In Mukuru, mapping information was used to justify the location of new water and sanitation infrastructure to improve access across the settlement. However, increased information on the part of the residents threatened existing power structures, where settlement leaders, including the area Chief were able to control activities and determine resource allocation owing to their status and control of information. In this regard it is important to involve all actors, including structure owners and residents alike, in order to avoid conflicts and the sabotage of upgrading activities. There is a need to appreciate existing power structures within informal settlements before commencing mapping and enumeration activities. It is important to allay the fears of both tenants and owners, who may view such activities as being aimed at evicting them.

In the next chapter, the focus will be on the role of key actors in the upgrading process. Their participation and its related impacts will be examined.





*Sanitation infrastructure, Mukuru*



*Exposed and poorly managed drainage infrastructure, Mukuru*



*Poor solid waste disposal, Korogocho and Mukuru*



*Water pipes and collection point near drains, Mukuru*

**Figure 5-11 Existing Conditions in Informal Settlements**



## **Chapter 6**

Actors, Participation and  
Geo-information Tools

## **Chapter 6: Actors, Participation and Geo-information tools**

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*Geo-information tools are seen as a potential liberator of socially and politically marginalised groups, and thus as a source of democratising power for newly networked groups. If information is power in this sense, and if community is built through dialogue, then the tools permit both to emerge for those who would otherwise have no voice and no space for collective action. (Pickles, 1995:10).*

## 6.1 Introduction

The analysis of the findings prompts discussion in five areas: (1) actors and their roles; (2) an analytical perspective of the participation ladder; (3) the effects of lack of information (information shadow); (4) barriers and challenges to participation; and (5) the ethical questions arising from the integration of GI tools in upgrading processes.

The discussion provides answers to specific questions (listed below) which pertain to how the integration of GI tools enhances or limits participation by various actors within upgrading processes. The discussion focuses on how the application of GI tools influences participation by actors, as well as their decision-making capabilities. This is also the central focus of 'Public Participation Geographic Information Systems' (PPGIS) approaches. In Section 6.6 an analysis is made of whether the scale and context of the upgrading and application of GI tools affects the participation of communities.

The research objective and questions are restated below:

1. To examine how integration of GI tools in upgrading processes enhances participation by and subsequent empowerment of communities
2. To explore the key roles of the various actors with respect to integration of GI tools in upgrading
3. To examine how GI tools shape relationships between the different actors involved in the upgrading process
4. To examine the ethical implications resulting from participation by communities in processes where GI tools are used in upgrading processes?

The questions related to the objectives are:

1. Does integration of GI tools help in developing platforms for all-inclusive participation, decision making and improvement of the living conditions in settlements?
2. Does integration of GI tools in upgrading processes enhance the community knowledge base and how that knowledge is used in decision making?

3. How do GI tools empower groups or individuals and increase their participation and influence decision-making processes?
4. How does the integration of GI tools affect the relationships between different actors involved in the upgrading process?
5. What barriers hinder communities from fully participating in upgrading processes?

## 6.2 A Theoretical and Epistemological Perspective

*Participation” can be thought of in (at least) two core ways: as specific activities that individuals engage in or in the broader purposes that participation is supposed to achieve. (Schlossberg and Shuford, 2005:16).*

Understanding community participation is recognised both conceptually and in terms of the role that intended beneficiaries and local community organisations can, and do, play in the design, implementation and management of development projects (Moser, 1989). Participation which is seen in the light of a planning and policy approach was illustrated by the ladder of citizen participation (Arnstein, 1969), which frames participation in terms of citizen power. Arnstein described citizen participation as “the redistribution of power that enables the “*haves-not*” citizens, presently excluded from the political and economic processes, to be deliberately included in the future” (Arnstein, op cit: 351). The lower levels of participation were characterised by manipulation, informing and consulting communities, while the highest entail partnership and citizen control. Arnstein’s model shows participation as seen to increase the relative level of citizen power.

Arnstein however failed to take into account the dynamic nature and evolutionary nature of user involvement. Tritter and McCallum (2006:165) further point out, that the linear, hierarchical model of involvement presented in Arnstein’s ladder does not recognize that stakeholders would result to different methods of involvement in relation to different issues and at different times. Additionally, Arnstein ignored the possibility that some of the actors would not wish to be involved or participate in decision making processes.

UNCHS (1984:6) justifies participation by arguing that:

1. Participation is an end in itself and people have the right and duty to participate in the planning, implementation and management of projects which affect their lives

2. Participation can be seen as a means to improve project results. Through participation, more people can benefit, implementation is facilitated, and the outcome responds better to the needs and priorities of the beneficiaries
3. Participation is a self-generating activity which stimulates people to seek participation in other spheres of life, in a self-reliant manner, thereby enabling them to become capable of identifying and dealing with their problem (UNCHS, 1984:6).

Theoretically, participation in planning is anchored by Healey (2003) in collaborative planning theory. Healey (2003) also argues that participation is closely associated with strategic approaches to the 'governance of place'. Healey maintains that participation involves attention to the qualities of place and of process, the 'good city' and its 'good governance' (ibid:116). Healey further points out that engagement in governance processes by actors generates ways of thinking and acting that influenced subsequent experiences of governance.

### **6.2.1 Planning, participation and technology: a nexus.**

Spatial planning, public participation and technology, viewed in an integrated manner, leads to the emergence of Public Participation GIS (PPGIS). PPGIS represents a broad notion that the spatial visualization and analysis capacities inherent in GIS present a unique opportunity for enhanced citizen involvement in public policy and planning issues (Schlossberg and Shuford, 2005: 16). Likewise, empowerment and technology are closely linked, given that most information used in decision-making processes within land-use planning, environmental planning or even social service provision, has a spatial facet. Maps can help to visualise and communicate data to other actors, which may lead to better policy and decision making (Sieber, 2006).

Although GI tools are associated with map creation, this process can be viewed as a collaborative planning practice (Schlossberg and Shuford, 2005). Maps can be a key component in grassroots change efforts (Talen, 2000), and can help illuminate issues of equity and community conditions upon which a community may organize and take action (O'Looney, 2000). The tools if used properly can help people make better decisions by enabling improved communication, design and analysis (Kingston, 2002; Al-Kodmany, 2000). Criticisms levelled against GI tools in planning processes regard the deployment of

the tools as a positivist approach, which reduces complex social processes to points, lines and areas. Further to this, critics maintain that technology only facilitates power to remain in the hands of those who are going to use it or the governing class (Sieber, 2006: 491). Although GIS with a social and qualitative approach (Qualitative GIS) is easy to conceptualize, its implementation in GIS practice has proved elusive. One reason is that GIS discourse reinforces the notion that GIS practice is rooted within a purely quantitative epistemology (Kwan, 2002a:273).

To counter these criticisms, public participation GIS (PPGIS) emerged and was seen to facilitate access to technology by all stakeholders. Ontological perceptions of PPGIS view it as a supply-driven and pragmatic approach to engaging the public in applications of GIS with the goals of improving the transparency of and influencing government policy (Sieber, 2006: 492). Sieber further points out that the key thematic focus areas of PPGIS and increasing GIS in decision making are concerned with:

1. **Empowerment:** (technological and informational empowerment of citizens may lead to increased participation in decision-making by communities using GIS)
2. **People and Place:** (where contextual factors and the characteristics of people in the participatory process are important)
3. **Technology and data:** (This relates to access to geo-spatial data, its development, use, sharing, and dissemination)
4. **Governance:** (It is assumed that institutional conditions affect access to GIS data and consequent participation).

### 6.3 Actors and their Roles

According to Schlossberg and Shuford (2005), to ensure sufficient inclusion, actors or stakeholders in mapping activities should include: those who are affected by, bring knowledge or information to, and possess the power to influence, a decision or programme. With this in mind, actors include: non government organisations (NGOs) and community based organisations (CBOs) who play an advocacy role; being close to the community they are able to contribute to a definition of its needs and to organise their participation. Similarly, faith-based organisations have a consensus-building role, while the settlement/community leaders organise and rally residents behind the upgrading project (Milbert, 2006:309). The communities within the settlements are key actors, as demonstrated in the following section.



### 6.3.1 The community mappers

McCall and Dunn (2011) underscore that the importance of active participation by all stakeholders at all stages of any community mapping activity, including those which involve GI technology, is a prime factor in fostering acceptability between governed and governing. Furthermore, they take cognisance of other issues arising such as: who is participating? Who controls the types and inputs of data and knowledge? Who handles and analyses the information? Who has access to GI tools and techniques? And who owns, uses, or has access to, the outputs?

The community in Mukuru were instrumental in collecting data on environmental health status. Using their local knowledge the mapping teams (which were composed of residents from the settlement) identified and mapped facilities on the Google Earth models provided by Goal-Kenya (**figure 6-1**). Also relating to the mapping and data collection process, the residents gave information about the water and sanitation facilities available, their ownership and maintenance details. The community also helped in providing security and guidance to mapping teams, as well as moral support. Due to earlier sensitisation efforts by Goal-Kenya and elders, the community was cooperative with the mapping teams, as they were eager to realise better sanitation and environmental health conditions.

Community health workers and peer counsellors in Mukuru played a significant role in the village boundary demarcation process, based on their local knowledge of the area. This group of people was preferred by Goal-Kenya, given their extensive networks within Mukuru, which they had developed during the course of social work.



Figure 6-1 Sample Map Produced by Community in Mukuru *Source: Goal-Kenya*



In Mahira the community was involved in activities such as enumeration and boundary establishment. Although the community members who were involved in the enumeration were not trained surveyors and therefore lacked necessary skills and knowledge, Pamoja Trust officers were at hand to provide technical assistance. During the enumeration process, clear roles and duties were specified. Those without good reading and writing skills were tasked with duties such as counting structures and tenants or asking questions using local dialect, while other team members took down details and filled in checklists. As illustrated by Susan who had no formal education; *“we in the village don’t know how to use the map. We could only count the tenants and structures”*. As in the case of Mukuru, the enumeration teams relied on the goodwill and participation of the community to obtain relevant information regarding the settlement, as pointed by an enumerator from the settlement:

*“Without the participation of residents, enumeration would not be possible because residents know their areas better [...] we were in different teams, one doing the structure numbering using paint, the other filling in the questionnaire and the third assisting in obtaining pictures of tenants and structure owners.”* Beatrice, enumeration team member.

In Korogocho the active participation of the community is demonstrated across the entire process from data collection to membership in the management committees. During the mapping exercise, teams drawn from the respective villages collected attribute data pertaining to each structure, such as demographic characteristics of occupants, infrastructure availability and housing conditions. Updating maps was carried out during this phase of the upgrading process. The satellite image model which had been acquired before the upgrading process did not reflect the actual ground status. Owing to the dynamic nature of settlements, new structures had been constructed and others demolished and therefore these changes had to be reflected in the base maps provided. The mapping teams updated these new developments by taking measurements and plotting on the mapping model.

Each village within Korogocho nominated six individuals to represent different categories or groups of people. The composition of the committees overseeing the mapping and enumeration included youth, women, structure owners, tenants, and a government representative (usually a village elder).

### 6.3.2 Women and youth

Despite the increasing focus on women and youth participation in community planning, in practice these groups of people often remain outside the process. The role played by women and youth in participatory mapping processes is important, as underscored by Sliuzas (2003) and Kwan (2002b). Gendered participatory mapping helps us to understand how women interact with and are shaped by spatial dynamics. According to McLafferty (2002:266), mapping and GIS are important tools that may be used by women to acquire knowledge outside the realm of their daily experience and for connecting their personal experiences to a wider social and political agenda.

In Mukuru both women and youth were involved in the mapping and upgrading process. This is understandable, given that part of Goal-Kenya's aim is to support youth and children's development in low income settlements. The main role played by youth and women included data collection and participation in the community action planning (CAP) sessions. The participation of women in enumeration and mapping activities in Mahira was not without difficulties. Some women, who were single mothers or headed households, for example, found it difficult to effectively participate in the enumeration and upgrading process, owing to their additional responsibilities. Such a sentiment was expressed by Susan, when she observed that:

*"[...] we were at cross roads at times since we had to get involved in long meetings and got home late. Our husbands could have chased us away from home. It was simply the drive to get a better life that made us do this."* Susan, woman leader from Mahira.

As sole bread winners, some of the women found it difficult to participate in enumeration and mapping activities because they had to devote their time to other income generating activities, as observed by a settlement elder from Mahira:

*"Here women are busy with business and therefore could only get time in the afternoons to participate in the enumeration"* Njoroge, elder from Mahira.

The youth in Mahira provided security to enumeration teams. The crime rate and insecurity in Mahira, as in many other informal settlements, is high; therefore the presence of younger members offered protection to the mapping teams. As pointed out by Joseph, a settlement elder, *"the youth played an important security role. You could not*

walk freely with a camera in Mahira. The youth would be guarding the camera and the enumerators as well". Although not directly related to enumeration and mapping activities, the security of the mapping teams needed to be assured if the activities were to proceed without hindrances.

In the three settlements studied, the participation of younger people provided a platform for them to express their views and concerns. Their participation in activities ranging from data collection to representation in the residents' committees signifies the recognition of their valued contribution towards the issues affecting them. This notion is echoed by Horelli (1997), who sees it as a way of adding the voice of youth to collective deliberation and decision making.

### **6.3.3 The settlement elders and chiefs**

Given the authority, and sometimes command, these leaders have over settlements, their role was significant one, worth mention. Nevertheless, communities expressed different views regarding the role of their leaders, some identifying supportive contributions, while others pointed at obstructive roles.

In Mukuru, the community leaders and Chief were supportive to the upgrading process, as witnessed by their decision towards sanctioning the application by Goal-Kenya to undertake the proposed activities. Protocol requires that organizations intending to carry out activities of a development nature within informal settlements first notify the community leaders, including the Chief. As pointed out by a resident from Mukuru during the focus group discussion:

*"[...] without their permission it would be difficult to undertake the exercise [...] all decisions in the village have to involve the elders so that it is not seen like you are planning to do bad things. They are therefore very influential and they even influenced people to support the mapping process."* Mukuru resident.

The settlement elders, who are seen as having direct access to the community, played the role of informing them on the usefulness of the proposed interventions. To this effect they stepped in to allay fears or counter reservations held by the community. The leaders went further in helping to identify suitable sites for the location of new toilet facilities that

were to be constructed by Goal-Kenya. The setting and importance of settlement elders is expressed by a resident:

*“It is difficult under normal circumstances to enter the village. When you want to introduce new initiatives, there is always some resistance. The elders (some who are old) are important. When Goal-Kenya explained to them the essence of the project, they (elders) went ahead to sensitise the residents. We were able to make start the project.”* Kioi, Youth leader from Mukuru.

The above demonstrates the importance of the community elders and area Chief. They are seen as instrumental in facilitating the mapping exercise by legitimising it. Additionally their knowledge of the settlement was helpful when it came to delineation of the village boundaries.

By contrast, the Chief in Mahira was not involved in the initial phase of the upgrading process. As pointed out in Chapter 4 (challenges to upgrading), some of the Chiefs are not supportive towards initiatives which are likely to lead to the erosion of their powers. As illustrated by COHRE, the Chiefs had immense power to an extent that:

*[...] there is nothing anyone can do in the informal settlements, from the repairing of one’s house to the building of toilets, without the authority of the Provincial Administration, through the local Chiefs. (COHRE, 2005:56).*

Upgrading and eventual secure land tenure is seen as a threat to their status, which explains their lack of support in Mahira. With this in mind, the community deliberately avoided the support of the Chief, as described by a resident:

*“The Chief did not participate at all. He preferred to see the village remain in its state. If you needed to improve your structure, you needed to seek consent and possibly even pay for the proposed activity. The money would be shared between him and the elders. He only came to know about the process when we invited the City Mayor on July 30<sup>th</sup> 2007 to address the tenure issue. They (Chief and elders) had no option after they realised we had gone so far with the upgrading process.”*  
Pauline, Mahira resident.

As mentioned earlier, the settlement leaders have close links with the community, which they use for example to communicate information or gather views and information about

people's needs. In Korogocho, the elders also took it upon themselves to request residents to volunteer information regarding their individual households. Some of the residents did not see the essence of the mapping and data collection exercise and therefore opted not to support it. It took the intervention of settlement leaders to convince them of the purpose and importance of providing household details.

The Chief in Korogocho plays an instrumental role in communicating to the residents through "*baraza*" (public forums) about the progress and objectives of the upgrading process. *Barazas* are used to communicate important news regarding activities affecting residents, to them. In the case of Korogocho, the Chief informed the community on the intention to widen the road to allow for drainage construction. This prompted those who had constructed road reserves to remove their structures to allow for road widening.

#### **6.3.4 Organisations – governmental and non-governmental organisations**

The key role played by organisations in supporting upgrading activities where GI tools are applied has been well illustrated (Hasan, 2006; Glöckner *et al.*, 2004; Sen *et al.*, 2003). Organisations, especially NGOs, help to mobilise communities, technical skills and capacity building.

NGOs played active roles in Mukuru and Mahira. In the case of Mukuru, it was Goal-Kenya who initiated the mapping process and upgrading activities. They facilitated the process by providing spatial data (Google Earth base maps) which were used for mapping the water sanitation and environmental conditions in Mukuru. Before the commencement of mapping, Goal-Kenya had approached the area chief and leaders to inform them of their intention to address existing environmental health challenges. The organisation also played a key role in training the mapping teams (some of whom had no prior knowledge of handling geo-spatial data) on data collection using the tools. In the later stages of the project, Goal-Kenya facilitated a community action planning session where all actors in Mukuru deliberated on how to improve environmental health conditions in the settlement. The organisation also provided resources to construct new infrastructure (bio-centres) aimed at improving access to water and sanitation within Mukuru. The Pamoja Trust went a step further to support the community to advocate for secure tenure. Having successfully mapped and enumerated the entire settlement, the Pamoja Trust mobilised the residents to petition the City Council for the land they

occupied. The community was able to secure allocation of the land, which opened the door for the construction of permanent structures.

UN-Habitat and the Ministry of Housing among other partners played key roles in the Korogocho settlement upgrading. They provided technical expertise to the upgrading process and regularly met with KRA to plan interventions. UN-Habitat further provided support towards a comprehensive household survey and analysis of the data collected which was used to generate a settlement profile report.

Government ministries in Korogocho provided the necessary technical assistance to the upgrading process given that some of the skills were not available within the settlement. The Ministry of Local Government provided surveyors and social planners, while the Ministry of Lands and Settlement provided planners, who were to support the development of the settlement layout.

With the support of external actors and equipped accurate geo-based information regarding their settings, communities within informal settlements are able to negotiate with city and national governments for improvement of living conditions as well as secure tenure. This is supported by Hasan (2006) in illustrating the role of Orangi Pilot Project–Research and Training Institute (OPP-RTI) in supporting communities in the *Katchi Abadis* (squatter settlement) in seeking for better sanitation and road infrastructure.

### **6.3.5 Participation by tenant or landlord: does it matter?**

Tenants and those who own structures within the settlements are the subjects in this discussion. Tenants, who are the majority within the settlements, have been perceived to be less powerful than landlords. Upgrading is seen as capable of changing the power balance between these two groups. Through upgrading, tenancy regularisation is implemented, which in effect puts an end to the informality often used to justify the demolition of settlements (Dafe, 2009:27). This implies that the regularisation of tenancy through upgrading mechanisms is a sensitive issue, likely to arouse conflict between tenants and landlords.

In Mahira, landlords did not support mapping and enumeration activities because they were aware of the implication of such activities. At first this threatened to disrupt the process and thus maintain the status quo. Landlords were eventually persuaded to accept

the proposal where all residents irrespective of their status were to be treated equally when it came to land allocation. This resulted in the equal subdivision of land between all residents by the council. In this case, if the community had approached the City Council without a unified voice regarding the potential beneficiaries, it would have been difficult for them to petition for secure tenure – as expressed by a settlement leader during the focus group discussion:

*“[...] we encouraged our members to accommodate each other and be contended with the little space provided after subdivision. The members were told that the City Council did not have any more land to allocate people, therefore we had to be satisfied with our area”* Njoroge, settlement leader, Mahira.

The composition of KRA is made up of representatives, with a mix of gender, age and status. The landlords in this case make up more than 30% of the entire membership. While each group nominated 1 member to the village committees, the landlords were allocated 12 seats (Table 6-2). This captures the power and influence of the landlords within the settlements. Initial attempts by the Pamoja Trust to carry out mapping and enumeration in Korogocho were disrupted by the landlords, who saw this as a move to take away their property and allocate it to the tenants. The tension was between tenants, who were mainly from the Luo tribe, and landlords who were from the Kikuyu tribe. The landlord, through KOWA (the Korogocho owners' welfare association), resorted to the courts to stop the enumeration and mapping activities. This resulted in curtailing the enumeration exercise, which was viewed as a threat to peace in the settlement. Had the tenants won the case, and successfully accomplished the enumeration exercise, they would have been enjoined as interested parties in the land (Weru, 2004: 53). Landlords perceive the underlying reason for tenants participating in and supporting upgrading as being to acquire land which they (the landlords) already have invested in. Therefore, it is not surprising to see enumeration and mapping processes as largely supported by tenants, who see this as their gateway to secure tenure.

Within the UN-Habitat/Government of Kenya- and Italy- supported upgrading programmes, the landlords under the umbrella of KOWA and the tenants under KRA have since agreed to let the mapping take place. The outputs from the mapping will ensure all structure owners are known, as well as their tenants. Both KOWA and KRA are represented in the mapping and enumeration process. The final verification of the outcomes by the KOWA and KRA members has resulted in support and faith in the

system. As a show of support by the landlords for the process, all structures mapped as having encroached onto the road reserves were removed, to pave the way for new roads in Korogocho. As argued by McCall and Dunn (2011: 5) GI tools have the capacity to alter the social perspectives of local users. Through mapping and enumeration activities, the antagonism between tenants and landlords has eased off, as both see the sense of having spatially-based information which has the potential of improving their settings

#### 6.4 Inclusion, Transparency and Empowerment

Parker (2006:472) identifies three important aspects in defining community mapping activities which address governance. First, the mapping activity implies a collective endeavour that represents a range of community members within a setting. Second, community mapping is attentive to the process, not just the product: how participants work together and negotiate issues of place and representation is as important as the map itself. Third, community-mapping strives to be inclusive, empowering, and transparent.

Additionally, GI tools can contribute to good governance by supporting disadvantaged groups to access resources and services independently or by protecting the disadvantaged or inarticulate with respect to laws and property rights (McCall and Dunn, 2011:7).

As illustrated in Section 6.3.2, the upgrading processes examined were seen to include residents across gender and age (Table 6-1). In Mukuru, mapping teams were composed of more female members, which illustrates the importance attached to participation by initially marginalised sections of communities.

**Table 6-1 Composition of Mapping Team, Mukuru**

	Mariguini	Kayaba	Kisii Village	Kayaba C and D	Kayaba E	Total
Male	4	-	1	-	1	6
Female	7	3	2	3	2	17
Total	11	3	3	3	3	23



In Korogocho, the composition of the residents association depicts a gender balance with including youth representation that otherwise form a significant proportion of the settlement population (Table 6.2).

**Table 6-2 Composition of Resident Associations, Korogocho**

Category	Total	%
Youth representative	6	17%
Women representative	6	17%
Landlords	12	32%
Tenants Representatives	6	17%
Government Representative (usually a village elder)	6	17%

Mukuru residents carried out the identification of residents to undertake the mapping of the settlement. This was conducted in a transparent manner, whereby the selection criteria applied were having knowledge and experience in similar activities and residing within the settlement and village to be mapped. This approach ensured the mapping team was composed of competent persons approved by the community. During the CAP sessions, 10 representatives from each constituent village in Mukuru were identified to verify outputs by the mapping team. This again signifies transparency in the process and the involvement of a wide section of the community. In the prioritization of projects phase, the community was involved in identifying priorities within their settings. This presented them with the opportunity to express their needs, which might not necessarily coincide with those of opinion leaders or even Goal-Kenya.

In Mahira and Korogocho, communities have been involved in the verification of details pertaining to tenants and structure owners. Information obtained during the mapping and enumeration process is displayed at the area Chief's office for public scrutiny. This open and transparent approach ensures that malpractices such as adding non-existent tenants or falsifying records are attenuated. This procedure is carried out in Korogocho before information is presented to the Government for consideration in relation to land allocation. Through the use of GI tools communities, in this case, have ensured the transparency of the operations taking place as part of the upgrading processes. This notion is supported by Drew (2003), who maintains that GIS and mapping tools can increase the

transparency of public decision-making for community members, thereby encouraging broader engagement.

Corbett and Keller (2005) observed that the integration of GI tools in planning processes might empower disadvantaged groups by enabling them to use the language and tools of decision makers, and thereby influence events that affect their lives. The assumption here is that GI technology can provide a critical complement to marginal sectors of society and grassroots efforts that are undertaken to empower communities (Kyem, 2004; Harris and Weiner, 1998). The outcome is exemplified in Mahira where the community was able to use spatial information to advocate for land tenure. It is difficult to comprehend how the residents would negotiate and eventually convince if they did not have any information to support their claims. Before these negotiations, the City Council had maintained that there was no settlement present on the ground, implying that the land was free for allocation to other competing needs. The community and its leadership took a spatial decision, making their approach akin to that of planners emphasizing quantitative information backed by local knowledge. A similar experience is presented by Elwood (2001: 738) who explored how GIS application by a neighbourhood association was able to change the language, information and practices of community decision making.

## **6.5 The Participation Ladder: An Analytical Evaluation**

Butterfoss (2006:324) points out that community participation can be measured both as a process (who, how, when, why, how many, and how much community members participate in an initiative) and as a programme outcome. An evaluation of participation can be based on indicators such as the opportunities and levels of decision making, amount and duration of time devoted to activities, degree of local ownership (perceived or achieved) and community representativeness. However, the choice of indicators depends on the purpose and scope of evaluation.

The International Association of Public Participation (2006) recommended five levels of public participation – inform, consult, involve, collaborate, empower – with each subsequent level enabling participants further, with increasing impact on the overall process. Lower levels of participation (inform, consult) involve the use of informational tools such as maps, aerial photographs, virtual globes, and interactive Web sites for

public comments. The higher levels of participation (involve, collaborate, empower) would require analytical tools for simulations of decision impacts in addition to utilizing informational and communication tools. This framework is used to evaluate the level of community participation within the three case studies examined. Each stage of the upgrading process (**figures 5.1; 5.2 and 5.3 in Chapter 5**) was taken into account and the participation level indicated.

### 6.5.1 Participation in Mukuru

The pre-identification, consensus building and role designation stages involved low-level participation issues. The community was invited to meetings called by the area Chief where they were informed of the project proposed by Goal-Kenya. The data gathering was a consultative process, where the community and Goal-Kenya decided what codes to use and what data to collect. A joint planning session was conducted where the mapping teams and elders deliberated on the data collection modalities and resource requirements. The introduction of GI tools had significant impact in terms of raising the participation level in Mukuru. In the later stages of the project, outputs from the mapping activity were used to communicate issues during the Community Action Planning session. The decision to locate or build new infrastructure was taken following the outcome of this workshop. These planning sessions, which involved the mapping teams and community representatives, may be regarded as high-level participation, since the decisions made had the input of Mukuru residents through their representatives.

**Table 6-3 Mukuru Community Participation Level Matrix**

Stages Domain & Level	Pre-identification and consensus building	Roles designation	Data and information gathering	Decision making
Inform (Low)				
Consult (Low)				
Involve (Middle)				
Collaborate (High)				
Empower (High)				

### 6.5.2 Participation in Mahira

The initial stages of the upgrading process – mobilisation, sensitization, village profiling and data collection were low-level participation activities. The community was involved in meetings to inform them about the upgrading process. Similarly consultations were held between the Pamoja Trust, Muungano wa Wanaviji and the community to outline the upgrading process and seek the cooperation of the community.

After community support was obtained, the level of participation was enhanced through joint planning in village profiling and data collection. The process was driven by the community, who were determined to obtain accurate data pertaining to structure ownership and tenancy. It is important to note that data entry and analysis was primarily carried out by Pamoja Trust. Verification of the community database and spatial data collected was a consultative and collaborative process which involved the community, the Pamoja Trust and the Nairobi City Council officials. The impact of the GI tools is notable at a later stage (advocacy, resource allocation and implementation). The high-level participation, where the village spatial model and community database were used as advocacy tools to petition the Nairobi City Council for the village land, was managed by the community through their elders.

Sections 5.4.1 and 5.4.4, show how communities were empowered through the process of data acquisition which they used for engage the government and other authorities in the quest for improvement of their settings.

**Table 6-4 Mahira Community Participation Level Matrix**

Stages Domain & Level	Mobilisation and Sensitization	Village Profiling and Data Collection	Data Entry and Analysis	Verification of database	Advocacy, Resource Allocation and Implementation
Inform (Low)					
Consult (Low)					
Involve (Middle)					
Collaborate (High)					
Empower (High)					

The Mahira community did not participate in data entry and analysis. This was performed by Pamoja-Trust on their behalf which explains the blank column.

### 6.5.3 Participation in Korogocho

The community was involved in low-level participation activities such as sensitization and verification of structure ownership and tenants’ details. The participation in *barazas* called by the area Chief or the project donors in Korogocho is regarded as a low-level participation activity.

The planning for new infrastructure was managed by the Korogocho residents’ committee, with participants drawn from the respective villages. The KRA holds meetings to deliberate on issues regarding the upgrading, updating of maps and of the settlement database, as well as verification of structure owners details which are a high-level participation activity. The impact of GI tools in enhancing high-level participation and decision making is notable in such instances as when the planning teams deliberated and mapped out future road proposals, for ratification by the project engineers and planners.

**Table 6-5 Korogocho Community Participation**

Stages Domain & Level	Formation of Korogocho Residents Association	Boundary Delineation and Structure Numbering	Verification of Structure Ownership database	Planning for New Infrastructure	Construction of New Infrastructure and Secure Tenure
Inform (Low)					
Consult (Low)					
Involve (Middle)					
Collaborate (High)					
Empower (High)					

It should not be assumed that participation would guarantee empowerment of a community. Likewise participation alone cannot, however, guarantee socially just development since the process of empowerment through participation according to Slocum and Thomas-Slayter (1995:3) can be undermined by the motives of the traditional

power holder, power relations, and inequalities of access to information and participatory mechanisms

## **6.6 Participation and Geo-information tools – Do Context and Scale Matter?**

Sowman and Gawith (1994:564), making reference to case studies in Hout Bay (South Africa), maintained that scale and location, among other factors, were important in determining the level of participation, especially that of poor communities in project planning and decision making.

In Chapter 5, sectoral and comprehensive mapping and subsequent upgrading processes were discussed. Sector-based approaches were observed in Mukuru, where the focus was on specific aspects (environmental health and secure tenure respectively).

With regard to the sectoral approach, the participation of the community was characterised by a more hands-on approach, where Goal-Kenya took the Mukuru community through a process of orientation and the use of GI tools. The process started with the community being introduced to the use of Google Earth maps to map environmental health conditions within their village. Within each village it was the community and mapping team that collected and mapped the locations of the environmental health facilities and showed this with appropriate stickers (**figure 6.1**). The final outputs were village-based outputs, with stickers showing spatial details of environmental health.

In Mahira, the community, assisted by Pamoja Trust officials, collected spatial data to map the boundaries of the village. Other data collected included the location of permanent structures and existing roads serving the village. By contrast with the Mukuru community, the community in Mahira relied entirely on the Pamoja Trust for technical support including the analysis of spatial data. They were, however, instrumental in helping to collect data regarding the structure ownership and tenant details which were used to develop a village based database. This information later proved important in the negotiations with Nairobi City Council.



















In Korogocho, which is a comprehensive upgrading scheme, the community played a vital role in the collection spatial data through their assistance in the process. The base map provided by UN-Habitat and the Ministry of Local Government was used to update data

on the existing situation with regard to new developments on the ground. The verification of ground details was done by village committee members. The structure numbering process was carried out by the community and the outcomes communicated to UN-Habitat and the project facilitators. In this process, officials from the Ministry of Lands (Physical Planning Department) and Ministry of Local Government (Urban Development Division) were present to guide the community. Despite having good knowledge of their settlement, the community did not have full control of the mapping process in Korogocho.

The cases of Mukuru and Mahira illustrate the fact that scale is important when it comes to participation and mapping, especially when this is undertaken by communities. Small-scale mapping operations using simple and easy-to-understand tools like Google Earth maps enabled community members and mapping teams to produce spatial models of their areas for the planning of new infrastructure. Large-scale operations like the Korogocho case involved complex activities and the use of spatial analysis and mapping software, which the communities had no experience and skills to operate.

A comparison is provided in Table 6.5, which presents the analysis of the three cases. To standardise the matrix, similar comparison variables which cut across the cases have been used.

Table 6-6 Comparison Matrix: Do Context and Scale Matter?

	<b>Comparison Variables</b>					
<b>Variables</b>	Degree of local ownership  <b>Low to High</b>	Involvement in development and usage of spatial database			Impact of geo-information tools on overall participation  <b>Low to High</b>	Representations of gender  <b>Male and Female</b>
<b>Case</b>		Data Collection <b>Low to High</b>	Data Analysis <b>Low to High</b>	Use of outputs for decision making		
Mukuru (Sectoral Mapping)						
Mahira (Sectoral Mapping)						
Korogocho (Comprehensive Mapping)						



The degree of local ownership of mapping processes was high for sectoral mapping in the Mukuru and Mahira cases, which are small-scale initiatives where GI tools were used. The large-scale or comprehensive mapping activity represented by Korogocho involves many actors, and sectors that range from infrastructure to land tenure. This is a complex activity and this explains why their level of ownership is lower, compared to the other two cases examined.

In all three cases, community participation with regard to data collection was high. With regard to data analysis, community participation is low in the cases of Mahira and Korogocho. In the Korogocho case, UN-Habitat initiated data collection and subsequent data analysis. In Mukuru, Goal-Kenya facilitated participation by the community in the analysis of environmental health data.

With regard to the use of outputs for decision making, the smaller-scale initiatives of Mahira and Mukuru showed that the communities used the outputs in a more comprehensive way to advocate for secure and improved environmental health conditions in their respective settlements.

Women's participation in mapping and related activities was high in Mukuru. This may be explained by the programmatic approach adopted by Goal Kenya to support the recognition of women and younger people's needs. The agenda of the initiating agency may influence the overall make-up of who participates; however, the complexity of the project and mapping processes can effectively lead to the exclusion of members of the community.

### **6.6.1 Can the poor map?**

In the three cases studied, the involvement of external actors (NGOs, international bodies or Government Ministries) was evident. They provided spatial data in the form of base maps upon which the communities were able to add data regarding conditions in their respective villages. In the case of Mahira, the Pamoja Trust went a step further in carrying out the data analysis.

In Mukuru however, the community was able to undertake the mapping of environmental health conditions within the respective settlement villages. The mapping teams were composed of members from the community who lived in the actual villages. Their good

local knowledge of the surroundings helped them during the orientation process and subsequent mapping process. The elders, community health workers and peer counsellors who worked within the villages were notable in this case. The delineation of boundaries in the case of Mukuru was done with the assistance of community health workers and elders (see Section 6.3, Actors and their Roles).

Updating new developments on the base map in Korogocho was carried out by KRA members. This was especially the case where new structures had been developed after the aerial photograph was taken. This aspect is emphasized by Cities Alliance who observed that:

*regarding enumeration, mapping and slum surveys [...] the key fundamental intention is that communities themselves, rather than third party professionals and development practitioners, collect information about their situation. They then use it to explore solutions and negotiate with relevant authorities. (Cities-Alliance, 2006:24).*

The process of making maps starts with gathering data of a spatial and attribute nature. Communities in the case study settings have demonstrated their ability to carry out this important basis for mapping. In Chapter 8, a framework is provided which recognises the critical role of communities towards developing maps and spatial models of their settings. The ability of communities within urban poor settings to map their settings is demonstrated in accounts (Karanja, 2010; CODI, 2008; Elwood, 2008a; Hasan, 2006). As observed by Johnson, *“Anyone can create a map that shows where streets intersect [...] the maps now appearing are of a different breed all together: maps of local knowledge created by actual locals”* (Johnson, 2006:220).

## **6.7 Barriers/Challenges to Participation**

There are often deep-rooted social and economic divisions preventing effective community participation. Lack of education among informal settlement dwellers complicates these divisions and political unrest and economic hardship intensify them.

Politicians often prefer to exploit or ignore settlement conditions rather than to ameliorate the social tensions that prevent community cooperation (World-Bank, 1994:32).

### 6.7.1 The gate keepers

The Chief and settlement elders control access to settlements, which compels outsiders such as development agencies to make an approach through them, before they can commence any interventions. The role of elders was also important, since they gave final sanctions regarding sites upon which new infrastructure could be built. Some of the Chiefs and leaders are known to use this situation to control all activities within the settlements and even ask for “*development fees*”<sup>10</sup> to sanction new developments. This was confirmed by a resident from Mukuru during the focus group discussions:

*“It is difficult to enter the village in normal circumstances. The Chief and elders (some who are old) will need to accept first. Therefore when you want to introduce new things there is resistance. But when we explained they were co-operative because they saw we were progressive and making strides in the right direction”*  
Kioi, Youth Leader from Mariguini village, Mukuru.

The actions of gate keepers may hinder the participation of communities, especially where the latter are opposed to certain actions which the elders or Chief support. Gate keepers may also hinder the participation of women on cultural grounds (some cultures do not allow women to take up decision-making roles in society). The power dynamics expressed here show the importance of gate-keepers in determining the level of participation by communities in different contexts.

### 6.7.2 The information shadow

In this context, the information shadow is used to refer to situations where individuals or the community did not have access to information they may require for decision making or negotiating with government. Communities lacking information are limited in the way they

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<sup>10</sup> Used to describe payments made by residents in informal settlements intending to put up new structures or extend existing ones. Upon payment of the fees the developer is allowed to commence. The fees levied are dependent on the nature and scale of proposed activity.

participate, as they are not able to develop networks and make informed decisions. As expressed by Candler *et al.*, (2006)

*community effectiveness is limited by lack of access to current and relevant data. The lack of information and the capacity to analyse it constrains the ability of the communities to respond to requests from industry and government for input on proposed development. (Candler et al., 2006:56).*

As demonstrated in previous chapters, GI tools helped communities develop vertical and horizontal linkages within and outside their settings during the upgrading process. The community in Mahira, for example, used outputs from the mapping process to petition the Nairobi City Council for land. In Mukuru the community was able to make decisions regarding where to site new infrastructure based on the outcomes of mapping environmental health aspects. Through enumeration and mapping, residents were able to increase knowledge about the larger community living in the settlement.

The information shadow may be analysed at the individual or settlement levels showing challenges the communities experienced as a result of not having information, in this case information generated by the use of GI tools.

Taking the case of Mahira, at the individual level, prior to the mapping and enumeration process, the residents did not have an organised approach or even information they could use to petition for secure tenure. They simply did not have good knowledge of what transpired beyond their household setting. Susan from Mahira describes the situation before the mapping took place:

*"[...] enumeration and mapping the village made me known by all people. Initially I would be confined within my house and have little to do with the outside world. Today ask anyone and they will bring you to my house"* Susan, woman elder in Mahira.

A similar account is given by an elder from the settlement who observed that:

*"before the enumeration took place, the area Chief and other elders took advantage of the information shadow which the residents were in. They took advantage of this situation to harass residents and nothing could proceed within the village without their consent."* Njoroge –Elder from Mahira village.

However, it is important to note that making information more accessible does not automatically make it more useful or more democratic in its effects. To achieve this, information needs to be linked to processes of social mobilisation (Wheeler, 2011:1). The democratizing potential of information is closely linked to the process of social mobilisation: who is demanding the information and for what purposes — and what capacities exist for using the information (Berdou, 2011).

### 6.7.3 Tension and Conflict

Does mapping or use of GI tools cause tension?

The landlords in Korogocho believe mapping and developing a settlement-wide database of structure ownership and tenancy will lead to the exposure of their private information. The process of structure numbering and enumeration is seen as a political activity in which the tenants will be able to lay claim to the land upon registration. This was the case in Mahira and the other settlements in Kenya such as Soweto East in Kibera,<sup>11</sup> where both tenants and landlords were treated as equal and allocated land and houses. Tension typically arises given that landlords lay claim over the land on which their structures are built while tenants demand the right to be settled in the settlement. Some structure owners in Korogocho have since registered strong reservations regarding the mapping approach taken by the government and donors. For example in 2002, the Pamoja Trust tried to conduct a mapping and enumeration exercise in Korogocho, but the landlords saw this as a way to take away their property, and hence rejected it.

The location of new infrastructure is bound to be a contested affair, with groups of residents advocating for desirable facilities to be located near to their dwellings. Influential persons such as settlement elders can determine the location of new infrastructure by pulling rank. However, mapping the location of toilets and bathrooms within Mukuru resulted in the production of spatial models showing zones where residents did not have access to sanitation facilities. These models helped to suppress potential conflicts arising from the use of resources and from the location of the new infrastructure.

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<sup>11</sup> This is a project under the Kenya Slum Upgrading Programme (KENSUP) jointly funded by the government, UN-Habitat and the World Bank Cities Alliance. New houses were built to accommodate tenants and structure owners alike.

Given the power dynamics within settlements, people serving in the residents' committees or holding other leadership positions are viewed to have influence and control over numerous aspects of the community. Individuals who lost out during elections for committee representatives were seen to be sources of conflict within the settlement. As remarked by the secretary to the residents' association (KRA), *"the few who lost during the election of village committee representatives are the trouble makers. They have chosen to oppose the upgrading process and cause chaos"*.

## **6.8 Participation and Geo-information tools: Ethical concerns**

Chambers (2006:6-7) observed that some of the ethical concerns in participatory mapping and GIS include taking peoples' time, raising expectations, extracting information only for outsiders' benefit, exposing people to danger, repeating activities and causing tensions in a community. Moreover, Pickles (1995:17) maintains that the proponents of GIS technology, especially in socioeconomic applications, *"typically fail to consider the ethical and political questions that emerge, as GIS institutions and practices are extended into socioeconomic domains"*.

Obtaining information from communities without their full consent and knowledge may be regarded as unethical. Not all residents had been sensitised to the upgrading process and related activities. In Korogocho for example, some residents were not willing to volunteer information, citing lack of information and prior notice regarding the exercise. As expressed by the Secretary to the KRA, John:

*"[...] there were sections of the community who did not want to volunteer information. They felt the information would be used to evict them and allocate land to others. They only did so after I convinced them about the purpose and importance of doing so."* John, Secretary to the KRA.

In Korogocho, some residents expressed concerns regarding the numerous data collection activities taking place in the settlement. The community had recently participated in the national population census exercise, which involved collecting similar

household data. The notion of “over researched”<sup>12</sup> communities is presented here as observed by a resident of Korogocho:

*“people were tired. Some of them felt this was interfering with their life and not necessary. They had just been through a population census and felt overwhelmed by data collection”* Kanini, Korogocho resident.

The residents could not tell the difference between both population census and settlement mapping and enumeration, and so expressed their reservations. The uncoordinated nature of data collection (including data collection for upgrading and planning purposes) within informal settlements may lead to communities being exposed to unethical practices.

The mapping process can be seen by landlords and tenants as a plot to evict or repossess land on which structures have been built. Evictions of communities within informal settlements are well documented (Omenya and Huchzermeyer, 2006; Weru, 2004; Otiso, 2003). The mapping activity in Korogocho had been opposed in particular by the structure owners, who regarded it as a government plot to evict them and also give tenants equal rights so that the land resource would eventually be shared with all, regardless of status (landlord or tenant). The fact that the upgrading process and related activities led to escalation of tension within the community raises ethical concerns. Chambers (2006) also maintains a similar view. Avenues needed to be developed to resolve tensions or sensitise communities about the need to collaborate and ensure that all parties and their concerns are taken into account.

Although the process of data collection to produce spatial models was well intended the process did not fully address existing challenges within the settlements. The communities still had many unfulfilled hopes and ignored issues which were equally important. Dunn (2007:632) observed that there is a possibility of participatory activities remaining academic exercises or “forms of participation for publication”, despite their effort to hear the voices of ordinary people and capture local knowledge.

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<sup>12</sup> Over the years, communities living in informal settlements in Nairobi have been exposed to many research activities carried out by individuals and organisations aimed at gathering data to understand the social, cultural and environmental conditions defining the settlements

Table 6-7 A Synthesis: Who Participates in the Planning, Mapping and Information Control

	Mukuru			Mahira			Korogocho		
	Community	NGO's	Government	Community	NGO's	Government	Community	NGO's	Government
<b>Stage I: Planning</b>									
Who decides on who should participate?	Diagonal			Diagonal			Diagonal		
Who participates in mapping?	Diagonal	Diagonal		Diagonal	Diagonal		Diagonal		Diagonal
Who is left out?			Diagonal			Diagonal		Diagonal	
Who identifies the problem?		Diagonal			Diagonal				Diagonal
Whose questions?		Diagonal		Diagonal					Diagonal
Whose view or perspective?	Diagonal	Diagonal		Diagonal					Diagonal
Whose problems, views and questions are left out?	Diagonal			Diagonal			Diagonal		
<b>Stage II: The Mapping Process</b>									
Who decides on what is important?	Diagonal	Diagonal		Diagonal	Diagonal		Diagonal		Diagonal
Who controls the use of information?		Diagonal		Diagonal					Diagonal
And who is marginalised?	Diagonal					Diagonal	Diagonal		
Whose map and legend?		Diagonal			Diagonal				Diagonal
Who is informed (Transparency)?	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal
Who understands the physical output?	Diagonal	Diagonal	Diagonal		Diagonal		Diagonal	Diagonal	Diagonal
<b>Stage III: Resulting Information Control</b>									
Who owns the output and keep the maps?		Diagonal		Diagonal			Diagonal		Diagonal
Who analyses the spatial information collated?		Diagonal			Diagonal				Diagonal
Who has access to the information?	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal
Who will use it?	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal
Who gains?	Diagonal			Diagonal					Diagonal
Who is empowered?	Diagonal			Diagonal			Diagonal		



## 6.9 Synthesis: Planning, Mapping and Information Control

The integration of GI tools in the upgrading processes in the three case studies is assessed in terms of whether it enhanced the transparency of planning processes, the engagement of communities and collaboration between communities, government and non-governmental organizations in the planning, mapping and control over information (Table 6-7). The integration of GI tools in these upgrading projects saw communities gain access to information they would never have had previously. Access to information may be regarded as a pathway to community empowerment.

### *Planning*

Who decides? In the three case studies reviewed, the respective communities were instrumental in deciding who should participate. In Mukuru for example, community health workers and peer youth counsellors were selected by the residents based on their experience and networks developed by working within the community.

Who participates in mapping? This was a collaborative activity with communities and external actors joining hands to collect spatial data. The external actors notably provided the base data (aerial photos or satellite imagery) to which the mapping teams contributed their collected data.

Who was left out? In Mahira and Mukuru, the government was not involved in the earlier stages. The key drivers were the Pamoja Trust and Goal-Kenya respectively.

Who identified the problem? The role of the community in this regard was limited. The agenda of the NGOs and government was prominent in problem definition. The community living in the informal settlements do not have the resources to initiate upgrading processes. The upgrading project initiators (mainly external) defined the problem which again is closely linked to the issue of whose view and perspective. The government initiated the upgrading in Korogocho to meet national development goals, while the Pamoja Trust and Goal-Kenya intended to meet organisational or programme goals.

Whose view was left out? Not all residents could participate in mapping or upgrading related activities. The uneducated or those without information regarding the existence of

the upgrading project were left out. People opposed to the upgrading process, such as a small number of landlords in Korogocho, were not included in the village committees which oversaw the upgrading and mapping activities. The Chief in Mahira was not included in the initial phases of planning, owing to his opposition of the project.

### *Mapping*

Who decides? The mapping process involved both communities and external actors. However, the control and use of the information varied across the cases. In Mukuru the information was controlled by Goal-Kenya, while in Mahira the community controlled the information. The Pamoja Trust in Mahira adopted a strategy of enabling the community by handing over the information to advocate for secure tenure.

Who was marginalised? As mentioned in the planning, residents who had no information regarding the mapping process were left out in the selection of members to compose the enumeration and mapping teams. The Mahira case saw the government and its agents (Chief) being marginalised, given the mistrust residents had towards them.

Regarding the map legend, providers of the base data (in this case the NGOs and government), and subsequently the data analysts, controlled the contents of the legend. The communities within these settlements lacked the skills and technology to analyse and produce maps. Data analysis and the production of models was carried out by the external actors, who also controlled the legend.

Who was informed? The entire spectrum of actors working within the settlements to address existing challenges were informed of the situation using the outputs generated. These outputs were made public and thus benefited all those interested in addressing the challenges facing informal settlements.

### *Control over Information*

Who has access? The community, donors and NGOs all have access to the outputs which they can use in various decision-making activities. Access here implies being able to use the information at will without seeking authority from either party. It is important to

note that outsiders (those not directly concerned with the upgrading) could only access the information from respective communities or organisations supporting the upgrading. In this case bureaucratic procedures were likely to be experienced by those trying to access the information. During the field work phase, I experienced similar problems with regard to accessing data held by the Ministry of Local Government (Chapter 3 – Study Limitations).

Who gains? The different actors stood to gain in varying degrees. In the end the community seemed to gain most compared to the other actors. The environmental health challenges facing Mukuru residents were addressed although not fully. In Mahira the community was able to secure tenure and better living conditions. In Korogocho the community will get new infrastructure and later secure tenure. The NGOs stood to gain by having programmes implemented within the settlements as well as having spatial data which they could use for future planning.

Who is empowered? The case of Mahira is unique in that the community was able to use the information obtained from mapping and related activities to advocate for secure tenure, a process they ably conducted with little support from external actors. The situation before that was characterised by a community living within an information shadow (Section 6.5).

The degree of local ownership is high for sectoral mapping in the cases of Mukuru and Mahira, which are small-scale initiatives where GI tools were used. The large-scale or comprehensive mapping activity represented by Korogocho involves many actors and sectors ranging from infrastructure to land tenure. This is a complex activity and thus explains why the ownership is lower compared to the other two cases examined.

In all three cases, community participation with regard to data collection is high. With regard to data analysis, community participation is low in the case of Mahira and Korogocho. In the Korogocho case, UN-Habitat initiated the data collection and subsequent data analysis. In Mukuru, Goal-Kenya facilitated the community to participate in the analysis of environmental health data to produce spatial models of infrastructure availability.

Female participation in mapping and related activities was high in Mukuru. As explained earlier in Section 6.2, Goal Kenya supported the inclusion of women and youth in their programmes. The agenda of the initiating agency determines the overall participation, while complexity of the project and mapping processes may effectively lead to exclusion

of members of the community. The design and approach to integrating GI tools into upgrading processes, as observed, determined the level of participation and use of outputs for decision-making purposes by the community.

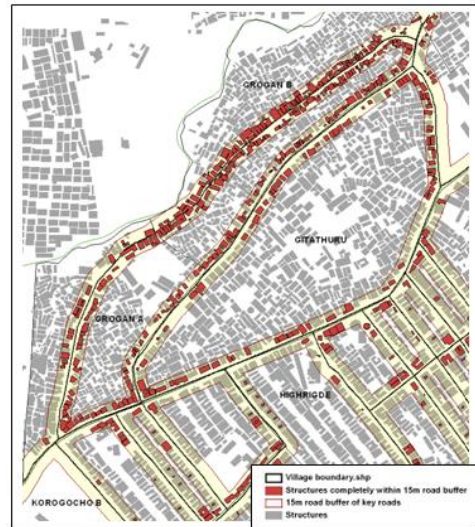
With regard to the use of outputs for decision making, the smaller scale initiatives of Mahira and Mukuru showed that the communities used the outputs in a more comprehensive way to advocate for secure and improved environmental health conditions in the respective settlements.

### **6.10 Summary**

The integration of GI tools leads to enhanced participation at various levels of upgrading. The positivist approach attributed to GIS-related processes emerges where information was regarded as crucial in decision-making procedures. However, public participation GIS elements and their inherent advantages to the communities in the three cases have been explored. Barriers still exist in the integration of GI tools for social gain within communities in low income settlements in the developing country context. The full participation of communities, especially at a higher level, is yet to be experienced. The intrinsic challenges that abound in the social, cultural and political landscapes hinder communities from achieving high-level participation.

In the three case studies observed, the individuals who participated in the mapping and enumeration activities were more empowered by skills and processes, while communities were more empowered by information and outputs generated as well as the tools used.





# Chapter 7

## Mapping for Change

## **Chapter 7: Mapping for Change**

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## 7.1 Introduction

*“When you map where you stay, it marks the beginning of development [...] mapping has necessitated many things which the majority couldn’t understand without a map.” (Gates, 2011) accessed from Mapkibera blogs*

Johnson (2006) provides a classic account of how John Snow, in mid 19<sup>th</sup> century Britain, relied on information and mapping tools to address health challenges facing London. Although Snow did not have advanced analysis tools, he was able to collect information on variables like water sources and match them with the incidence of cholera. This simple procedure for analysing human attributes forms the foundation of many spatial analysis processes today. It underlines the importance of accurate information in planning, especially within informal settlements.

A comprehensive improvement of the living conditions in informal settlements is necessary in order to create conditions for long-term poverty reduction and to gradually raise the quality of life in poor neighbourhoods. GI tools are considered valuable tools for supporting sustainable development and addressing challenges, especially within informal settlements. GI tools are integrated into upgrading processes with a view to providing an understanding of the highly complex, high-density squatter developments which present challenges to planners. Mapping and enumeration are an essential part of any squatter upgrading programme, especially when there are no official maps or data on households in the settlements that are to be upgraded (Karanja, 2010:218).

Diaz (1992) claims that traditional site analysis tools may not be suitable for identifying the social values hidden behind complex built environments. The primary objective of upgrading settlements is to address both the social and the economic concerns of the community. The integration of GI tools therefore has to support this process. The tools should be regarded as capable of enabling local authorities, communities and professionals to work in interactive ways to address the multi-faceted nature of informal settlement (Abbott, 2003:578). Spatial information technology and the diffusion of urban indicators according to Martinez *et al.*, (2008) present unique opportunities to improve monitoring of the living conditions in cities and to explain their effects on the population and in particular on the urban poor.



GI tools provide a unique platform for addressing informal settlement issues for various reasons. They have been preferred because decisions related to both development and the environment are inherently grounded in the physical locations of key populations, resources, and issues. Spatial information is central to these issues (Brodnig and Mayer-Schonberger, 2000). Another reason advanced for using GIS tools, as observed by Aksoylu (2005:2), is that traditional methods of information management are hard to use in the planning process of complex urban areas such as informal settlements. GIS provides the capacity for dynamic querying and analysis, display of information and more understandable representation.

Barry and Ruther (2005) observe that managing informal settlements involves, amongst other things, planning and controlling where they are located and how and where they grow; improving the social, economic, and basic health conditions in them; and ensuring that residents in these settlements and neighbouring communities enjoy social justice. To address these issues, urban managers require up-to-date, accurate, data (social and spatial). Informal settlements hold certain unique challenges in this respect, due to their complexity and their frequently changing social and spatial conditions.

It is important to note that responding to environmental challenges within informal settlements requires access to accurate information. Communities and development partners alike need the information in order to make informed choices on what actions to take to address environmental problems that may affect them at individual or settlement level.

## **7.2 Theoretical Underpinning**

Smith and Marx (1994:2) regard technology as a key governing force in society and therefore consider it as an independent factor, one of a number of dominant factors that shape society. Discourse on technology, society and change are central to the technological determinism theory, which maintains that society is shaped by technological innovation. Interpretations of technological determinism share two general ideas:

1. that the development of technology itself follows a defined path not influenced by existing cultural or political settings, and

2. that, technology in turn has "effects" on societies that are inherent, rather than socially conditioned or produced, because that society organizes itself to support and further develop a technology once it has been introduced.

Proponents of technological determinism assert that technology plays a significant role in society and determines social change. Technology changes the way people think and how they interact with others. In this respect, change and social progress is driven by technological innovation, which in turn follows a predictable course. Croteau and Hoynes (2003) view technological advance as the central causal element in processes of social change. Technological determinism contrasts social construction theory, which maintains that innovation trends and their consequences are shaped by society itself. Cultural, political and economic settings play a key role in shaping technology and its related tools.

The integration of GI tools is expected to impact positively on users (organizations and communities) regarding the way they interact and address challenges within the settlements. Apart from addressing environmental challenges, the integration of GI tools is expected to bring transformative shifts in the society where they are applied. Such transformative shifts include the empowerment of communities to actively participate in decision-making processes aimed at changing the existing situation within their settlements. The key underlying elements of this social transformative process are data, decision-making models, the decision-making environment and people. More data leads to more information, which decision models go a step further to transform into knowledge. Stevens (2007) points out that the introduction of technology could lead to improvement in planning and design, thus leading to better decision making, the ultimate objective for having the technology in the first place.

Critics of technological determinism argue that what counts more than technical features are social and political issues concerning: the circumstances of production, modes of use, purposes, control and access, in other words the social or economic system in which the technology is embedded. Critics such as Murphie and Potts (2003:21) maintain that the relationship between technology and society cannot be reduced to a simplistic cause-and-effect formula. Technology and society are intertwined which implies that technology does not determine but operates within a complex social setting. According to (Finnegan, 1988:41) it is "*who uses it, who controls it, what it is used for, how it fits into the power structure, how widely it is distributed*" that determines the impact of technology on society.

In this chapter the study explores how the integration of GI tools in settlement upgrading has been used to address existing challenges and what other effects, such as social transformation, result from its use.

### **7.3 Uncharted Areas and the Justification for Geo-information Tools**

This research seeks to explore whether GI tools can be used in support of addressing existing challenges within informal settlements. However, there remain largely unexplored aspects about informal settlements that planners and authorities alike are unaware of, which inevitably hamper development initiatives (Huchzermeyer, 2009a; Sen *et al.*, 2003).

Sliwa and Bhatt (2008) maintain that if local authorities and governments are to improve living conditions in informal settlements, information about basic facilities like housing and water supply are crucial to identify areas of greatest need. To bring about long lasting improvements in these areas, the characteristics of the informal settlement population, too, need to be understood. If authorities want to understand both the needs of the settlements and the development potentials embedded in the resident population, communities and households must be given a voice in upgrading (ibid, :4).

One of the main obstacles to effective urban planning is a lack of comprehensive, up-to-date and sufficiently detailed information about urban areas. This lack of information is a major reason behind the failure of urban municipalities to include informal settlements in city-wide planning and urban development (Joshi *et al.*, 2002:225). The improvement of infrastructure and services, and house upgrading in informal settlements, has been hampered by a lack of maps showing plot boundaries and existing infrastructure (Hasan, 2006). Despite the realization that mapping and documenting informal settlements has important repercussions for urban policy, planning and infrastructure investment, such settlements remain largely un-documented in Kenya. Similar experiences exist in other countries such as Pakistan where city authorities lack up-to-date information on informal settlements as expressed in the following excerpt:

*Maps made available to the planning agencies, are only of settlements that they have planned, or of those informal settlements that they have regularized. The planning and mapping of planned settlements has been done in-house, while the survey of katchi abadis (informal settlements) has been done by private consultants hired by the Katchi Abadi Directorate (KAD). The katchi abadi surveys*

*are limited to those settlements on government land, and do not include settlements developed as a result of the informal subdivision of agricultural land and which constitute the bulk of the informal settlements in Pakistan that need to be integrated into the city infrastructure plan for which maps are required. (Hasan, 2006: 456).*

How can GI be used to navigate uncharted areas and address the challenges facing informal settlements? GI tools can be used to visualize human settlements and their characteristics. Subsequent to this, authorities and development partners can determine possible interventions and courses of action. In this case both the communities and development agencies in question are empowered. In planning and upgrading informal settlements, GI tools offer the opportunity to take an inventory of settlements' spatial realities and to link these with data from household surveys or official statistics. This information can be computed and spatially analyzed and interpreted. The visualization capabilities offered by GI processing tools enable communities and authorities alike to understand settlement dynamics.

The rapid growth and development of informal settlements in many developing countries renders conventional cadastral mapping incapable of providing up-to date information regarding their status. GI tools such as high resolution satellite images can give precise base map information (depending on when they are acquired) that has the advantage of being able to be linked with other data sources, such as social surveys of household characteristics. The possibility of generating thematic maps of informal settlements within a short time makes it possible to provide relevant and reliable information to the actors involved in addressing challenges within informal settlements. GI tools are regarded as particularly useful in assisting planning purposes, given that decisions related to both development and the environment are inherently grounded in the physical locations of key populations, resources, and issues, where spatial information is central to their management (Brodnig and Mayer-Schönberger, 2000).

The ability to represent informal settlements spatially, through the use of GI tools is seen as important in the upgrading process (Huchzermeyer, 2009a; Pérez and Pérez, 2008; Barry and Rüter, 2005). Viewed in this light, geospatial information management has the potential to completely transform the way in which informal settlements are developed. For GI to make an impact in the process of upgrading informal settlements, the key lies in developing a people-centred approach coupled with the integration of spatial and social

data (where data relating to the physical site or settlement is related to data relating to the people who live in the settlement (Abbott, 2003:591).

## **7.4 Addressing Environmental Challenges**

In this section, the discussion is based on experiences of integrating GI tools within the three case settlements to address environmental challenges. The previous section demonstrated how GI tools have been applied by decision makers to gain a better understanding of challenges within settlements. This was done by developing indicators and databases for the existing situation. In the following section, the study will show how settlement communities and other actors, such as NGOs, used GI tools to develop a basis for addressing issues within the cases. The benefits and transformations associated with integrating the tools are also analysed.

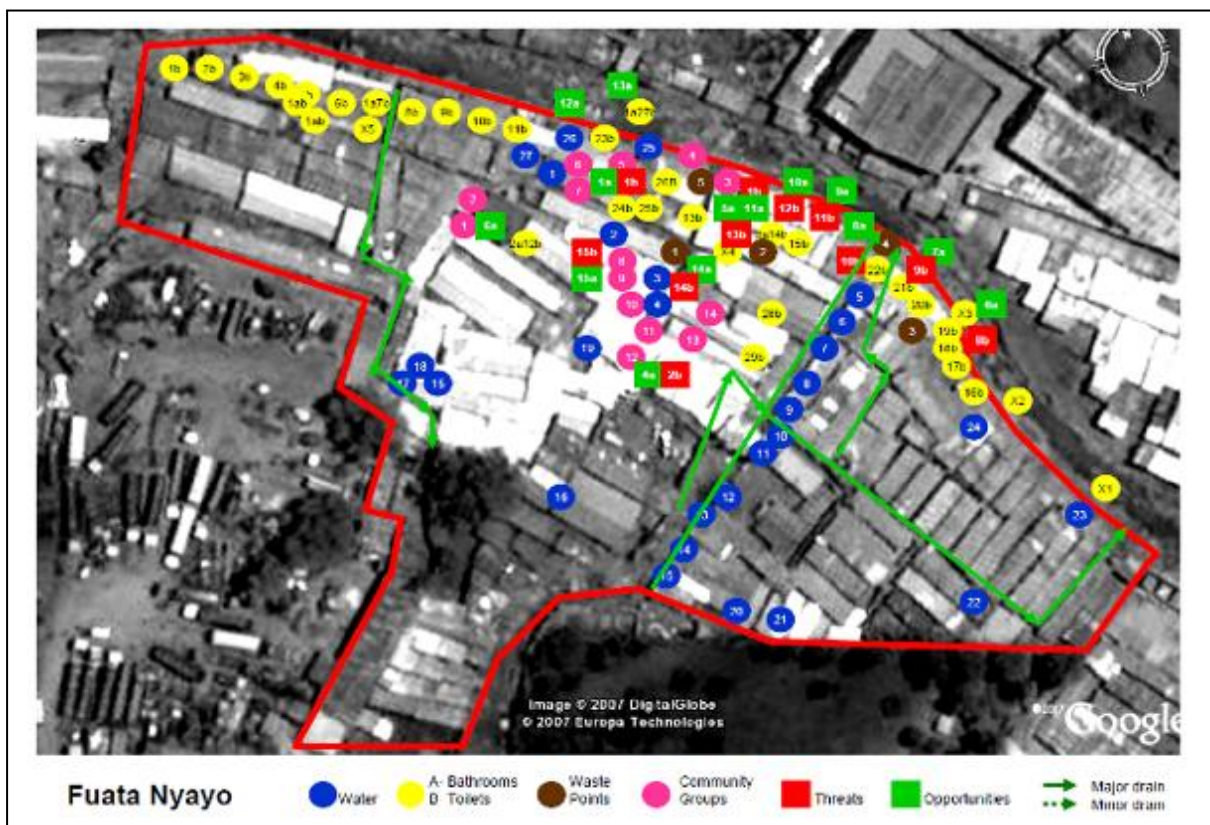
### **7.4.1 Addressing environmental health challenges in Mukuru**

#### *The setting*

Mukuru settlement comprises Kayaba, Masai; Kisii; Fuata Nyayo; Hazina and Mariguini villages. The settlement, which has a population of approximately 73,000 according to the 2009 population census, is characterised by relatively poor infrastructure and housing conditions similar to many informal settlements in Nairobi.

The poor health and environmental conditions in informal settlements have prompted actions by both government and NGOs to address the situation. The main purpose of the Goal-Kenya led environmental health initiative within Mukuru was to address water and sanitation challenges facing the residents in the settlement. To achieve this objective, Goal-Kenya adopted a fact-finding and planning approach, which integrated the use of Google Earth tools supplying high resolution images of the entire settlement. These were obtained from online sources and used as a basis for planning interventions. For each of the six villages, a Google Map-based model was obtained, showing the structures and key infrastructure, such as roads and natural features including the Ngong River (**figure 7.1**).

Members of the community were identified and trained to collect data on the current environmental health status of the respective villages. This data comprised spatial data and attribute data pertaining to these facilities, such as their condition and ownership. The data was compiled and presented in a model which showed the existing and infrastructure supply levels. The output enabled the community, Goal-Kenya and other agencies involved in addressing the challenges facing the settlements to visualize the situation and determine suitable interventions in areas that lacked access to basic sanitation (**figure 7.1**).



**Figure 7-1 Fuata Nyayo Village, Mukuru. Google Image Showing Location of Infrastructure** *Source: Goal-Kenya*

The stickers have unique numbers identifying particular infrastructure. A corresponding database was created showing attributes of the infrastructure. For example, each toilet structure was given a unique identification number, and attributes indicated such as its building material, condition and whether it was pay-per-use or free. Similarly, the water points had unique identifiers and their attributes, such as the cost of water, ownership and hours of operation, were included in the database.

In Hazina village the mapping exercise revealed an acute lack of water supply points within one zone of the village. This information was important, especially in determining where to locate new water supply points to ensure access to clean water supply. As explained by a resident,

*“water is only on one side of the village. The rest do not have. Many residents in other parts of the village do not have water since the water points are located by the main road.”* Mukuru resident.

Mapping the existing infrastructure also enabled the community to identify the causes of other challenges within the settlement. A community health worker for example maintained that:

*“using the maps we know which villages are experiencing flying toilet menace. Fuata Nyayo for example since their toilets were removed by NEMA. We can therefore know which areas need interventions.”* Community Health Worker, Mukuru.

#### *The situation and bringing about change*

Goal-Kenya was able to fund the construction of four new toilet blocks within Mukuru to help residents' access better sanitation facilities (**figure 7.4**). These were located in Kayaba (KUUM), Kayaba (Mukuru Joint), Kisii village (Nyakwerigeria), Fuata Nyayo village (Hope and Joy). **Figure 7.4** shows the location of new toilet facilities constructed in Mukuru to address environmental health challenges.

The decision about where to locate the facility was taken during the community action planning (CAP) meeting discussed in Chapter 5. Upon visualizing the current situation, a decision was made by all stakeholders present to locate the facility in a location central to all and where no other facilities were available. **Figure 7.2** shows the location of the new toilet block in Fuata Nyayo village which was decided upon by stakeholders. The use of spatial models showing existing features and developments on the ground helped in the decision-making process.

#### *Change attributed to increased information and awareness after mapping*

Community health workers who worked within Mukuru were able to use information generated by the mapping exercise to help the residents address existing environmental



challenges. Mapping revealed water sources that used plastic and PVC pipes for supplies which were prone to damage. As observed by a community health worker from Mukuru, “we advised people to use steel water pipes for supply instead of plastic pipes which damage easily and contaminate the water supply” Community health worker in Mukuru. Similarly, as a result of mapping the actors were able to understand their environmental health status better (figure 7.1). According to a health worker in Mukuru:

*“mapping helped us the community health workers to know the level of cleanliness in the villages. We could not know what was needed without the maps and graphs. After mapping we came to realize Hazina village did not have many toilets”*  
Community health worker, Mukuru.



Figure 7-2 New Toilet Facilities in Fuata Nyayo Village, Mukuru



The information from the mapping helped other stakeholders develop interventions. Private entrepreneurs for example were able to determine which areas to put up new water kiosks and pay toilets to serve the resident community in Mukuru. The Nairobi City Council was able to identify blocked drains and later unblock them. The maps provided valuable information, which was applied by different actors in various ways as highlighted by the residents:

*“[...] after mapping, other people and the private sector came in to address the problems. Today, if we were to go back and map the villages, we would find water everywhere. People have come in to provide water tanks and sell water to residents [...] some have taken advantage of the shortage to construct more toilets and pit latrines. Today the city council respond to our problems and waste collection areas have been built as a result of the survey.”* Kioi, Youth leader from Mariguini Village, Mukuru.



Figure 7-3 Sanitation blocks by Goal-Kenya in Mukuru





Figure 7-4 New Toilet Blocks Constructed within Mukuru



#### 7.4.2 The Domino Effect: from secure tenure to a better living environment

##### *The setting*

Mahira village, which is part of the larger Huruma area informal settlements, was established in 1978 by residents relocated from the neighbouring Kiamaiko area. In 2002, Mahira residents entered into a memorandum of understanding with the City Council to upgrade their settlement (Appendix H). The settlement, which occupies approximately 1.19Ha, has 899 households with an average household size of 3.2. The village has poor solid waste and sanitation services. These aspects have contributed to low living standards and exposed residents to disease and other ailments associated with inadequate sanitation and unclean environments.



**Figure 7-5 Environmental Condition in Mahira Settlement**

##### *Building the case*

The path to addressing environmental challenges within Mahira village started with the process of securing tenure for the residents. Upon acquiring tenure, the residents, Pamoja Trust and other development agencies such as CORDAID embarked on developing the area and thereby improving the infrastructure and services.

The upgrading process involved enumeration of residents, as well as taking stock of existing structures and spatial aspects of the village, requiring measurements of the area occupied by the village. The land had initially belonged to Nairobi City Council and was subject to ownership wrangles between the authority and residents.

The residents, with the support of the Pamoja Trust, organized a settlement mapping and enumeration process to collect data on land, physical planning, housing, infrastructure and household demographic data **(figure 7.6)**.

Through mapping and enumeration, each structure was numbered and its physical location established using GPS tools. The numbering enabled each structure to have a unique identification which was matched with ownership and tenant details. Photographic evidence of owners and tenants was acquired to support the details regarding each structure. A village database was developed which was subject to verification by the community to ensure correct details were entered.

The Pamoja Trust was responsible for assembling the data and later handed it over to the community, who used it to negotiate for secure tenure. After allocation of the land, a layout scheme was developed by the Pamoja Trust, where landlords and tenants were allocated equal portions of land to build permanent structures **(figure 7.8)**. These structures were put up with savings made by the community and assistance from external donors. The process of mapping and enumeration was important to the community and city authorities who previously had no accurate information on who lived in the village. According to the Weru (2004), such enumerations not only provide the means by which data are gathered to allow for local planning but also the process by which consensus is built and the inclusion of all residents negotiated.



**Figure 7-6 Enumeration and Mapping in Mahira** *Source: Pamoja Trust*

*Change attributed to increased information and awareness after mapping*

The Mahira community's acquisition of secure tenure was important in setting the ground for addressing environmental challenges and improvement of living standards. As mentioned earlier, both tenants and landlords were allocated equal parcels of land upon which they embarked on developing more permanent structures. The mapping and enumeration in particular had great impact on the upgrading process in Mahira. This was evident for example during negotiations with Nairobi City Council for land allocation and during the decision-making process for the allocation of land as expressed by a woman leader from Mahira:

*“The City Council would ask us during the negotiation meeting, how many people lived in Mahira? We were ready with answers. They were surprised that we knew the settlement dimensions and number of people living there [...] we realized we had a small parcel of land therefore we asked Pamoja to try and fit everyone in the area. It was better to get one small piece which would benefit you and your grandchildren for a long time”.* Susan, Woman leader from Mahira.

A layout scheme was developed by the Pamoja Trust with the help of other professionals which outlined parcel orientation, paths and roads to serve the village, as well as infrastructure layouts. Each structure had access to water and sanitation. Solid waste collection points were provided, as well as provision for drainage and electricity supply.



**Figure 7-7 Mahira: - New Structures besides Old Temporary Structures**

*Contrasting Landscapes.* In **figure 7.7**, the Mahira 'before' and 'after' situation settings are captured. On one side are the new structures made of concrete blocks including proper drainage and sanitation facilities.

With the spatial data collected on the existing situation in Mahira, the Pamoja Trust was able to plan for a settlement layout to accommodate tenants and structures. **Figure 7.8** shows the initial layout generated from the aerial image; and the new settlement layout which shows the layout of structures. These were developed after ground measurements were taken of existing infrastructure. The area was divided into 154 parcels and allocated to the households within the settlement (**model 2**).



**Figure 7-8 Mahira Structure Layouts Before and After Upgrading**



### 7.4.3 Addressing challenges: a multi- issue approach in Korogocho

#### *The setting*

The Korogocho informal settlement has an estimated population of 50,000 persons (2009 population census) residing on 1.5 square kilometres of land owned by the Government. It borders a large dumping site in Nairobi's Dandora area which poses an environmental health risk for the residents and surrounding settlements. The settlement has eight constituent villages, namely: Highridge, Grogan A and B, Githaturu, Kisumu Ndogo, Nyayo and Korogocho A and B (**figure 7.9**).

Environmental conditions in Korogocho are typical of slum settlements in Nairobi where large populations have limited access to basic infrastructure. There is limited access to proper sanitation and clean water supply. Solid waste management is poor and the road network is inadequate. Many of the structures are constructed with timber or mud and wattle, roofed with corrugated iron sheets.



**Figure 7-9 Korogocho Settlement and Constituent Villages**

### **The road to Korogocho and mapping the challenges**

The UN-Habitat/Government of Kenya led an upgrading initiative and undertook road construction and widening activities as initial interventions. The process involved mapping out existing roads and structures that had encroached onto the reserves. The use of aerial photographs and imagery was particularly useful for identifying structures that were on the road reserves. A road buffer was determined by the residents' committee and government planners, depending on the purpose of the road and anticipated traffic. The key arterial road serving the settlement was designated to be 15m wide. This implied all structures within this reserve had to be removed to pave the way for road and related infrastructure and expansion.

Using a GIS platform, a buffer was delineated and structures affected by the road widening were classified into two categories: 1) structures completely within the road reserve and 2) structures partially within the road reserve (**figure 7.10**). This process provided decision makers with information on who was affected by the new road. Relocation within informal settlements can lead to tensions and often violence in a bid to protect homes.

Structures that were entirely within the reserve were removed and the owners compensated and relocated within the settlement. Those whose structures were partially within the reserve were not compensated but had to move their buildings back from the road. A description of the process as according to the surveyor in-charge is given;

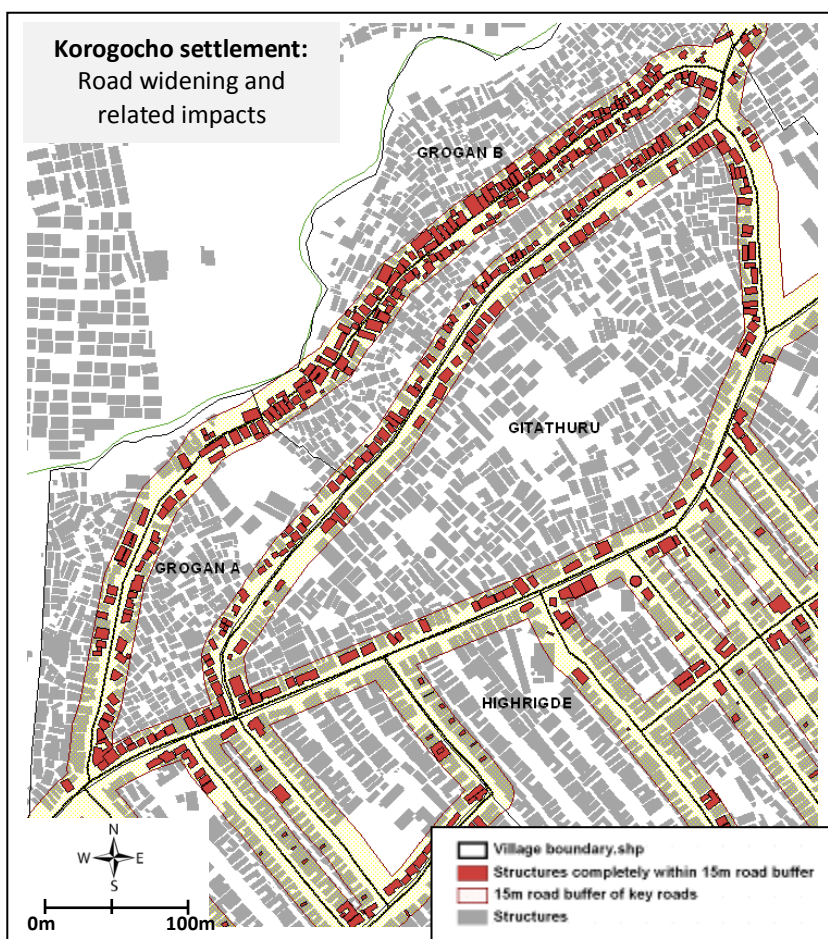
*“The process helped reduce tensions since even before road construction started, the planning team was able to identify who to negotiate with and approach the structure owners. Making public announcements that structures would be removed would cause tension and even opposition by the community towards the road construction. The tools helped with the visualization to identify concerned structures owners who we approached to discuss the road widening and need to remove the affected structures.”* Interview with Project Surveyor from Ministry of Local Government on 20<sup>th</sup> July 2010.

#### *Change attributed to mapping*

The use of imagery helped decision makers to visualize what impact new roads and widening activities would have on the existing settlement. Government officials used this



information to negotiate with owners of structures that were to be removed to pave the way for the road infrastructure. This approach helped to avert the protests likely were public announcements made to all residents informing them of the looming demolition of these structures, a move which would cause panic and possibly unrest among the community. The use of planning standards not ideal for informal settings results in the displacement of many structures / households. In this case the 15m road proposed within Korogocho settlement may be inappropriate given that many residents did not own vehicles. **Figure 7.10** shows structures that were completely within the road buffer and had to be removed.



**Figure 7-10 Structures Affected by New Road Construction**

*Profiling the settlement and implication for addressing challenges*

The Government and UN-Habitat, with the help of the Korogocho residents' committee, organized for socio-economic data collection for planning purposes. The data collected includes land tenure, status of the landlord (whether present or absent), duration of stay, number of persons living in a structure, and their bio-data.

The data, which is spatially referenced to each structure, was compiled and used by the government to support upgrading activities. Data on tenure and ownership is regarded as sensitive and this explains why the government has taken charge of the process to avoid manipulation or misreporting. Earlier enumeration and mapping activities by the Pamoja Trust led to manipulation of data, for example by inflating the population numbers or adding fictitious names to the list of residents. The fears of government and other stakeholders are expressed by an official working for a donor organization:

*“The Government cannot take responsibility for data collected entirely by the community without supervision by Government agents. Tenure data is sensitive which explains why the Government is heavily involved in the process. The Pamoja Trust had earlier allowed people to collect data on their own and they ended up registering even toilets as structures where people resided.”* Kago, Programme Officer with Kenya-Italy Debt for Development Programme.

The data will provide useful information, especially the population details which are important for determining how the land will be allocated to residents. Using a GIS platform, project partners will be able to identify tenure and ownership patterns within Korogocho for planning purposes. However, this information was not available to the public at the time of study.<sup>13</sup> The Government and residents’ association will identify absent landlords, who according to residents do not deserve to be considered when it comes to land allocation. However, this is likely to draw sharp criticism from landlords who have settled outside Korogocho.



**Figure 7-11 Structure Removal in Korogocho to Pave way for Road Construction**

<sup>13</sup> The socio-economic data collected by the Government and residents’ association was not in the public domain and therefore not available to the researcher during the time of the research. Structure ownership data is regarded as sensitive and gaining access to it would entail lengthy procedures.

In **figure 7.11**, Korogocho residents demolish structures which had encroached on the road reserve and the new road under construction is shown with its wide reserve.

## 7.5 Putting the Tools to the Test

Within Korogocho, the tools were applied to determine their suitability in identifying challenges facing the community. Socio-economic data relating to 110 structures in Kisumu Ndogo village were collected by the community (see Appendix D for checklist on data collected). The purpose was to provide data which was linked to particular structures for the purpose of understanding the characteristics of the settlement and also to test the usefulness of GI tools in doing so.

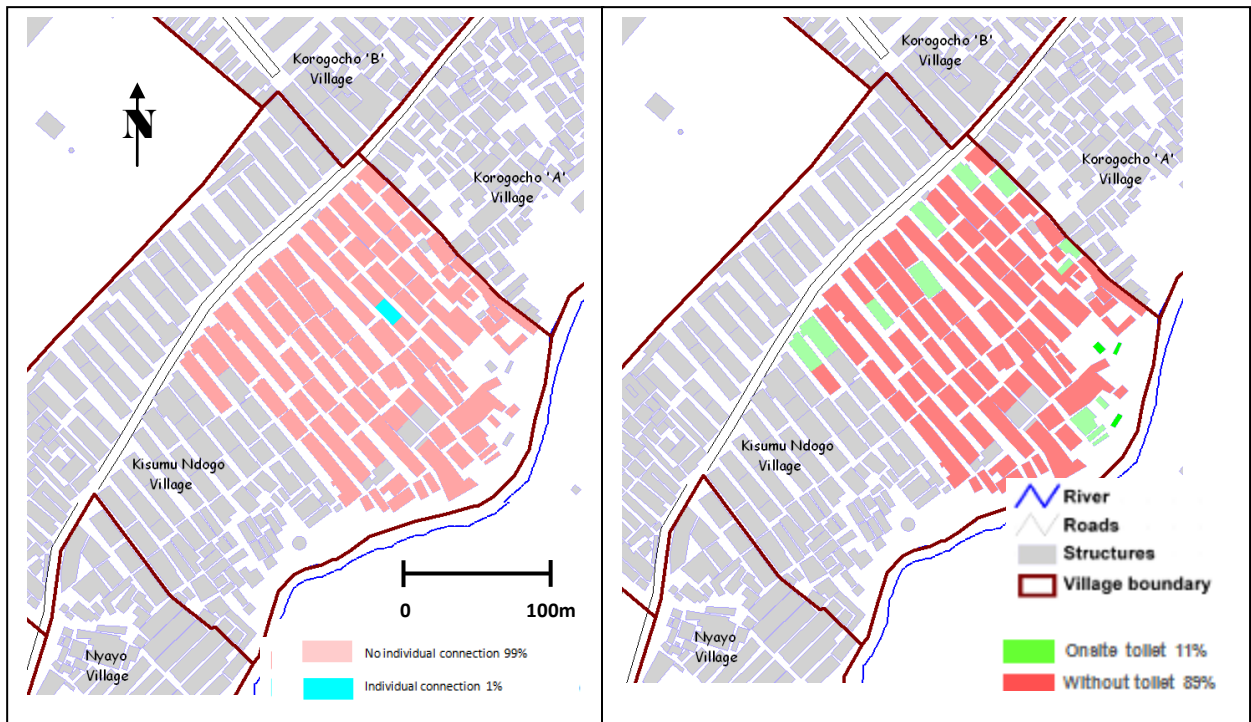
The attribute data collected from each structure included: population, landlord details (gender and whether they are absent or reside within the structure), structure number (useful for linking with spatial data-set)<sup>14</sup>, structure building material, availability of basic infrastructure and utilities (water, electricity and toilet), and the number of rooms. Using a GIS platform the attribute data was used to develop spatial models and a socio-economic profile of the settlement. For planning purposes these models are useful, because decision makers are able to visualize challenges facing individual structures, sections of the community or the entire settlement.

The need for accurate information to address environmental challenges within informal settlements has been emphasized before (refer to Section 7.2). Data regarding structure building material was analyzed to show individual structures by material used. In this case it emerged that approximately 80% of the structures within the select area were constructed using mud/wattle and 15% used galvanized iron sheets (**figure 7.13**). This information is important for road planning and expansion purposes, where, for example information on permanency of structures is necessary to estimate compensation in the event of demolition for road reserves. Information on structure building material may also be used for disaster management purposes. With spatial models derived from data collected, planners are able to visualize structures prone to fires or other hazards.

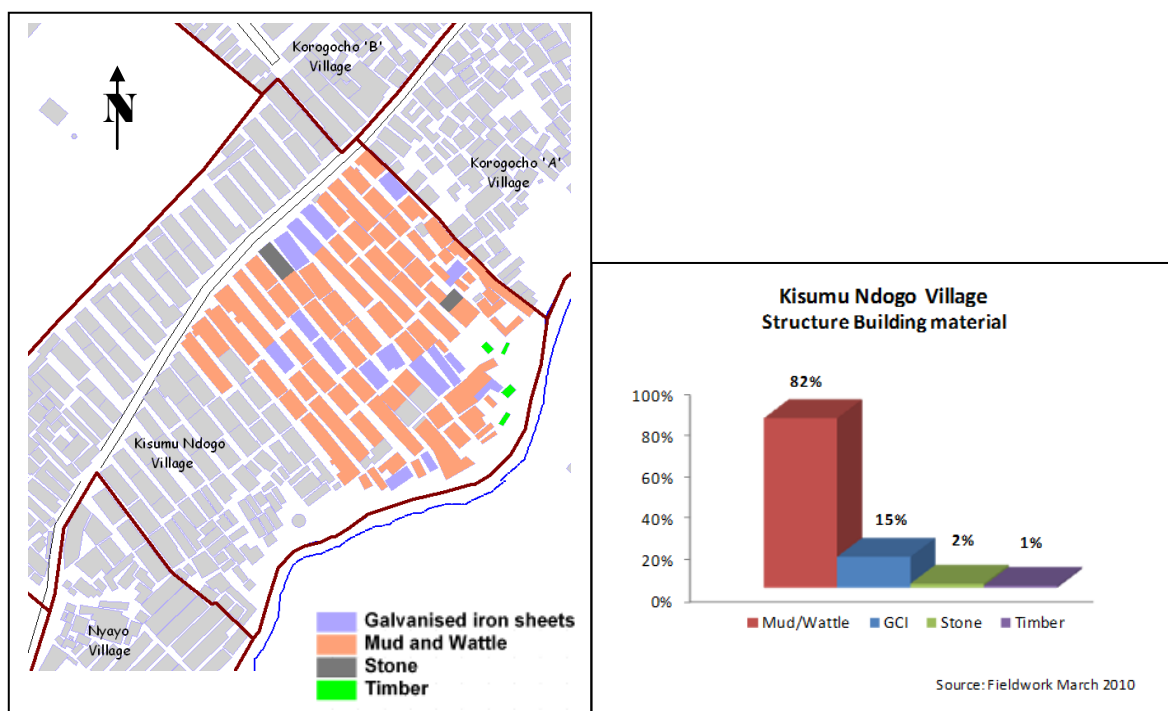
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<sup>14</sup> Within the GIS environment, databases may be linked using unique identifiers found or located in two different datasets - in this case structure number.

**Figure 7.12** depicts the state of access to basic infrastructure (water and sanitation). GI tools provide a platform to visualize and quantify access to basic infrastructure. By visualizing and quantifying access to infrastructure areas, health planners are able to understand residents' quality of life status. From the study it emerged that 90% of structures did not have individual water and electricity connections and access to toilet facilities.



**Figure 7-12 Spatial Model of Basic Infrastructure Availability (Water and Toilets)**



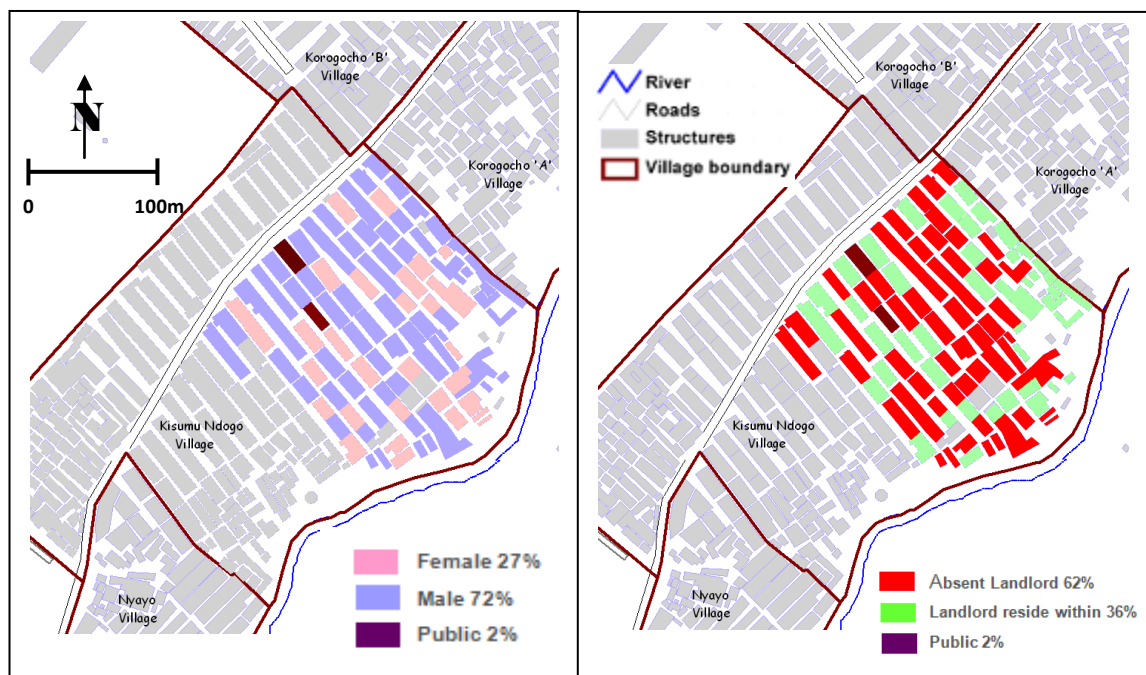
**Figure 7-13 Spatial Model of Construction Material (Walls)**



**Figure 7.13** shows individual structures classified by the nature of the building material used. Visualizing the building materials used for each structure will assist planners to understand the implications of new interventions, which may require the removal of structures on the ground.

### 7.5.1 Unmasking the Challenge

Data obtained from surveys can often mask the reality within informal settlements. Statistics, as opposed to spatial models of settlements, may not present a clear picture of the challenges faced by residents. Mapping individual structures and their attributes enabled the presentation of accurate access information, as opposed to statistically derived figures on access to basic services. This approach, supported by spatial tools, presents accurate and reliable information for decision makers to design interventions. According to Satterthwaite (2003b) it is the generation and presentation of *nonsense statistics* that hinders governments in developing countries from understanding the real challenges facing large numbers of the population who live within informal settlements. The aggregation of data is likely to mask the truth about challenges facing settlements. The research revealed that more than 60% of landlords were absent landlords (**figure 7.14**). This has planning implications for matters of obtaining consensus on development matters or allocating land to genuine residents or those residing in the settlement.



**Figure 7-14 Landlord Characteristics**

### 7.5.2 Addressing the Challenge: Planning for Water Supply

The data obtained from the socio-economic survey was used to model and plan for water supply. Although access to water and sanitation is considered a basic requirement and right, not all informal settlement communities have access to these essential infrastructures. From the survey it emerged that more than 90% of the structures within the area sampled in Kisumu Ndogo lacked individual water connections.

Suitable locations for community water points were identified which could serve households within a radius of 15 metres. This criterion ensured that all households had access to water within a reasonable distance. The outcome provided potentially useful information for planners and organizations working towards improving access to basic services. Additionally, GIS tools enable the integration of data from various sources, the analysis and visualization of which provides a basis for addressing environmental challenges (Zeilhofer and Topanotti, 2008; Glöckner et al., 2004). The model on water supply and access in Kisumu Ndogo demonstrates how the use of data on existing water points and structures can be analyzed to show the potential location of new water points to enhance access to facilities.



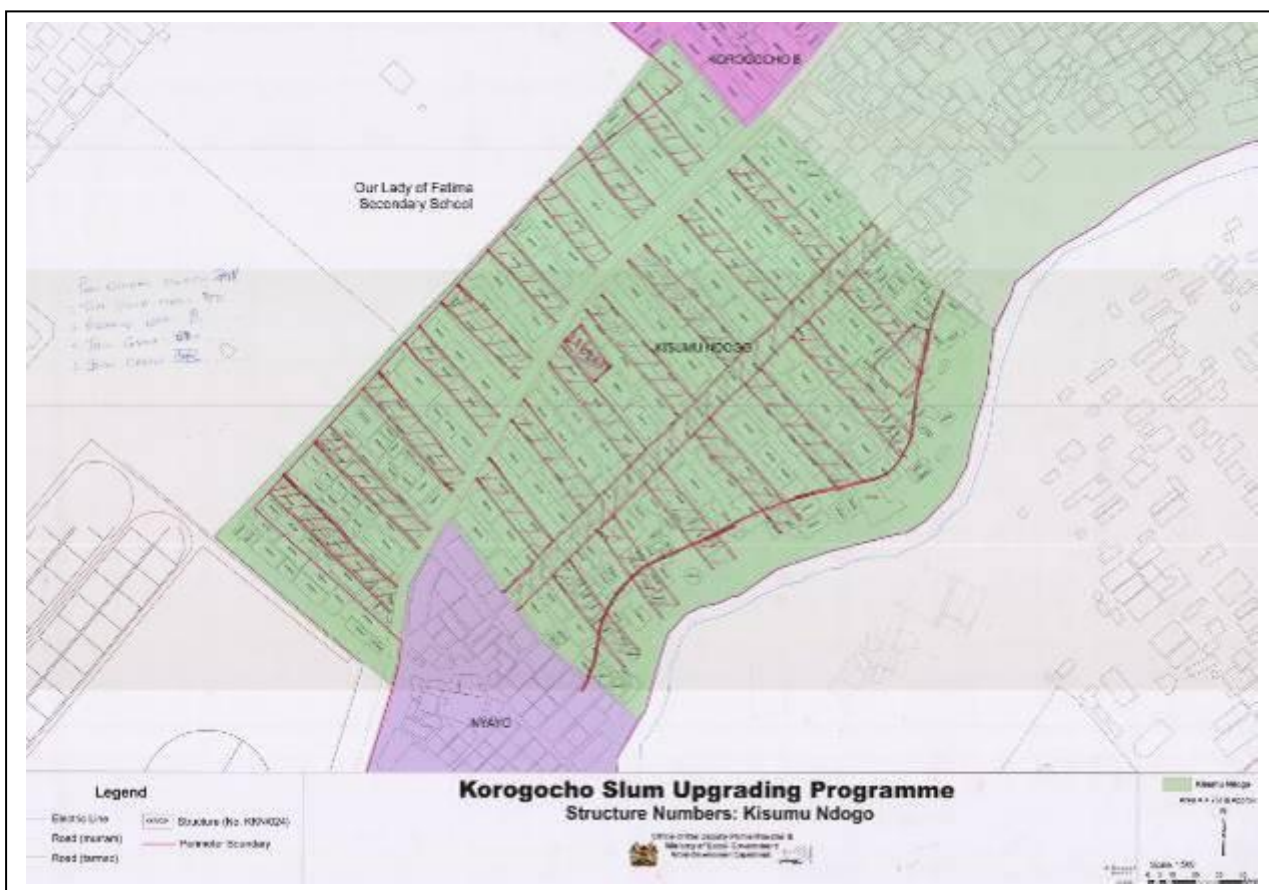
Figure 7-15 Modelling Water Supply and Access in Kisumu Ndogo, Korogocho

The left-hand image shows the existing situation in Kisumu Ndogo and the area served by its single water point. A total of 15 new water points have been proposed to ensure that households can access water within a reasonable distance of 15 metres. Each water

point can serve 43 households (146 persons). The assumption is that each structure has six rooms and is occupied by an average of 3.4 persons.

### 7.5.3 The community and Geo-Information tools

Residents of the Korogocho settlement used base maps developed from aerial photographs to plan for new road networks. Each village nominated five persons to deliberate on the new road network. The resultant proposal was forwarded to the Government for scrutiny and eventual implementation. **Figure 7.16** shows the proposed road network for Kisumu Ndogo which was designed and approved by community members. Signatures were appended to indicate community involvement and approval of the outcome

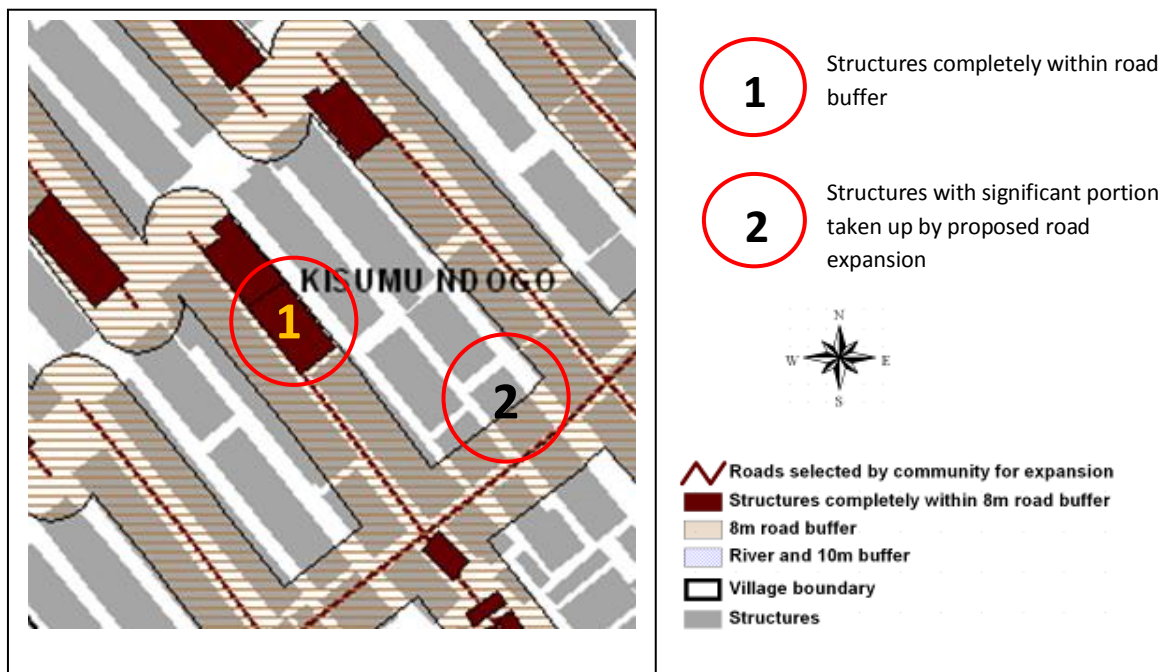


**Figure 7-16 Proposed Road Model Developed by Community** Source: Kenya Slum Upgrading Programme

#### *Evaluating the community model*

Using a GIS platform, analysis was carried out to determine the impact of the community proposals on the existing settlement. Roads were proposed to serve the entire village and

ensure a smooth flow of traffic. An 8m buffer was used to quantify the impact of road expansion on existing structures (see also Appendix G for community generated model for road network) . The model proposed by the community would lead to approximately 20% of structures in Kisumu Ndogo being completely within the road reserve buffer as displayed in **figure 7.17**. A significant portion of some structures would be taken up by the road in the process making them uneconomical. The tools in this respect are useful in helping communities to evaluate the impact of their proposals, and hence adjust them accordingly, which has the potential of minimizing disruption or displacement. In this regard, approaches that guarantee minimal disruption or displacement of communities are preferred.



**Figure 7-17 Impact of Community Proposal for Road Network in Kisumu Ndogo**

According to Abbott (2003), GI tools should be supportive of community planning processes and not merely seen as a technical tool. He maintains that GI tools should liberate local authorities, communities and professionals from the constraints of paper-based applications, and allow for the interaction between the spatial and physical elements on the one hand, and the social and economic opportunities on the other, in a three-dimensional virtual environment. The modeling opportunities provided by using GI tools enables stakeholders develop interactive ways to integrate, query, analyse and



visualize complex and multi-faceted issues facing informal settlements (Nour, 2011; Zeilhofer and Topanotti, 2008). Similarly, the tools are relevant in the monitoring of inequalities, targeting deprived areas, and reallocating resources (Martinez, 2009; Masser, 2001). Beyond addressing environmental challenges, GI tools have led to social transformations which are discussed in the following section. The modeling opportunities provided by using GI tools enable stakeholders to develop interactive ways to integrate, query, analyse and visualize complex and multi-faceted issues facing informal settlements (Nour, 2011; Zeilhofer and Topanotti, 2008). Similarly, the tools are relevant in the monitoring of inequalities, targeting deprived areas, and reallocating resources (Martinez, 2009; Masser, 2001). Beyond addressing environmental challenges, GI tools have led to social transformations, which are discussed in the following section.

## **7.6 Social Transformation**

GI tools have the potential to influence (positively and negatively) collective action and societal learning processes directed at spatial problem solving (Sliuzas, 2004; de Man, 2000). In this section, the impact of these tools on society, or communities within the settlements, is discussed.

For upgrading to be termed successful, physical and social change must take place within the targeted settlement. At community and individual level, there must be noticeable change regarding residents' status and role in decision making, increased opportunities and even enhanced networks. Abbott (2002b) observed that physical change within settlements needs to aid the broader social transformation of the settlement. The needs of the settlement as an entity and those of individuals are important and need to be taken care of during the upgrading process. Other social transformation indicators include the enhanced capability of communities to undertake development initiatives on their own during and after the settlement upgrading process (Imperato and Ruster, 2003:18).

### **7.6.1 The case of solid waste and youth in Mukuru**

*“As a result of mapping we have more employment and enhanced security. The youth and other residents are now selling water, collecting waste and therefore get money hence no need to steal from community. All this was because they got*

*information regarding areas that did not have services.”* Kioi Ngatia, Youth leader from Mukuru.

The mapping exercise revealed opportunities hitherto unknown to the community, and in this case the youth. The survey, which was supported by Goal Kenya, showed that solid waste was a key priority in Fuata Nyayo village. The unsystematic dumping of waste resulted in the blockage of drains and led to unhealthy living environments. Youth groups, such as Nairobi South Youth Group and Environmental Youth Against Crime, were formed after the mapping exercise to collect solid waste from households within Mukuru settlement.

Mapping also provided information regarding potential sites for waste collection and sorting. The open spaces within the settlement were identified as potential sites for waste management. According to community members, the information would help in managing and open spaces and protecting them from being misused or allocated to other users, as expressed by a resident:

*“From the information we now know where all the open spaces are located. We the residents are able in future to monitor these spaces. If anyone constructs on them we can easily find out. It is therefore important to keep the information well for future use.”* Resident, Mukuru Settlement.

The Environmental Youth Against Crime group, which operates in Fuata Nyayo village in Mukuru, was established with the aim of providing sanitation services such as collecting solid waste and cleaning drainage channels. The group collects waste from approximately 300 households and charges 1 dollar equivalent per month per household. This translates into approximately 300 dollars per month earned by the group from solid waste collection. The group network also provides a forum for educating members on social matters like drug abuse and HIV risk. Mapping structures and waste collection methods enabled the youth group to gain better information on community demand for better solid waste management. In effect, this information helped the group to expand operations, as remarked by a member of the youth group:

*“Before the mapping, the youth group in Mariguini collected garbage over the weekend from only 30 households. Today as we speak, the group collects*

*garbage from more than 300 households which helped them make money and uplift their standards”* Member of Environmental Youth Against Crime Group.

Other notable aspects of social transformation within Mukuru include the ability of the residents to participate in decision-making processes such as community action planning. In Mukuru, the community was able to make significant contributions regarding the prioritization of interventions to address challenges and which actors were responsible. Mapping activities and the community action planning forum provided platforms for community led decision making and hence determined the course and nature of interventions to address existing challenges. As a result of mapping, residents were made aware of all the blocked drainages within the settlement. This resulted in behaviour change on the part of the residents, as observed by a community health worker:

*“Mukuru residents are now aware of the need to have clean drainages. This was after the mapping of blocked drains. We now have cleaner air in the village especially after drains were unblocked and the river cleaned”* Community health worker, Mukuru.

#### **7.6.2 The youth and women in Mahira**

*“Things have now changed. The youth have reformed since initially you could not walk around the village easily. I think it must be the effect of involving them especially in the enumeration and later in the construction of new houses”* Woman elder, Mahira.

The involvement of younger people in the upgrading process has had a profound impact. Youth who were otherwise idle owing to lack of employment were initially engaged in enumeration process for data collection and security purposes. The mapping and enumeration resulted in the allocation of land to the residents by Nairobi City Council. Labour-intensive approaches were employed in the resulting house construction. This provided the area’s youth with job opportunities and skills which they are able to employ elsewhere to earn a living.

In urban areas within the sub-Saharan context and, in particular, informal settlements, up to 50% of households are headed by women, who are typically among the poorer strata of

the population (Kuiper and Van der Ree, 2006). Arputham (2008:329) for example discusses the important roles that can be played by women in upgrading processes, when they mobilize communities to advocate for better infrastructure. Women played a key role in Mahira during the upgrading process and its related activities. They formed part of the mapping and enumeration teams and were members of the team negotiating with the City Council for land allocation.

Mapping and enumeration provided Mahira residents with information, which they used to negotiate with the City authorities for land allocation. This information was empowering and gave a voice to voiceless individuals, households and the entire Mahira settlement. Before the land allocation and regularization of the settlement by the City Council, the residents of Mahira were at the mercy of the area Chief, who controlled all activities within the village, including land allocation and construction of new structures. With the allocation of the land to the residents and support from external partners (the Pamoja Trust) the community was able to take charge of their settlement and related issues without control or intimidation by the Chief or his agents. This entire process of mapping, enumeration and land allocation witnessed the empowerment of the community, which was not the situation before, when the community was powerless as illustrated in Chapter 5. This reinforces the views of Ghose and Huxhold (2001) and Barndt and Craig (1994) who pointed out that GI tools may enable the less powerful sections of society to create alternative options, hence potentially giving them a greater voice in decision making and policy debates.

### **7.6.3 Social transformation and benefits galore in Korogocho**

As in the previous cases of Mahira and Mukuru, mapping and enumeration activities in Korogocho resulted in social transformation. The youth who were actively involved in mapping and enumeration activities benefited from the employment opportunities arising from this. The expansion and construction of new roads within the settlement involved a labour-intensive approach, which in turn provided employment opportunities to youth within Korogocho (**figure 7.18**). The youth also formed part of the Korogocho residents' committee, which oversees upgrading and settlement-related matters in Korogocho.



**Figure 7-18 Korogocho Youth Engaged in Road Construction**

The new roads have resulted in the establishment of youth-managed small transport businesses serving the residents. The construction of the new roads has played a significant role in providing opportunities to the youth many of whom were believed to have been engaged in anti-social activities, owing to the lack of jobs.

#### *The story of the youth and the motor-bikes*

The younger residents have formed groups to purchase motor cycles, which they use to transport people from the settlement to the other destinations which are not served by public transport. They also operate non motorized carts which are suited to the transportation of goods, in particular to the nearby Kariobangi and Korogocho fruit and vegetable markets. According to the secretary of the Korogocho Residents' Association, the youth were able to start new business ventures as a result of the upgrading activities. He pointed out that:

*“There are more than 200 motor cycles operated by Korogocho youth due to better roads. Insecurity is reducing since the initially bad boys are now motor cycle*

*operators. They also act as vigilantes to maintain law and order in the settlement.”*  
John Okello, Secretary Korogocho Residents Committee.



**Figure 7-19 Motor Bike Operators in Korogocho**

A BBC feature<sup>15</sup> highlighted the key role played by the Korogocho youth in supporting the upgrading process. It was reported that: *“If the youth are not involved in the (slum) upgrading process, it won't happen”*; Youth from Korogocho.

*The irony is, the motorbike taxi service is being run by precisely the kind of young men who might have menaced their passengers in the past. Many of the motorbike boys were once offenders.* (BBC, Friday, 13<sup>th</sup> August 2010).

The integration of GI tools may be only indirectly associated with these social transformations, but the involvement of the youth in upgrading activities has a notable impact. Through mapping and enumeration activities, some of the Youth were employed as assistants or guide. In essence the activities benefitted otherwise idle and unemployed young people within the informal settlement.

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<sup>15</sup> <http://news.bbc.co.uk/1/hi/world/africa/8913543.stm> Accessed in May 2011

## 7.7 Unpredicted Changes

The integration of GI tools in upgrading does not always lead to desirable results. Mapping in Mukuru for example led to the demolition and removal of toilets that were polluting the nearby river by discharging waste. In Mahira, landlords (some of whom had more than one structure) had to forego part of their property to accommodate tenants who initially did not have any structure. This led the landlords to resist the proposal, but they were prevailed upon by settlement elders, who urged them to accept one parcel of land with title as opposed to many without legal documentation.

### 7.7.1 Conflict with authorities in Mukuru

The mapping of existing toilets and bathrooms in Mukuru revealed their spatial location and relationship to physical attributes like the Ngong River. The majority of the toilets located adjacent to the river discharged effluent directly into the river, which led to pollution of the surface water. The river is a source of water to communities downstream who rely on it for agriculture and domestic water supply.

Rivers and other surface water sources are protected by the Government under the Environmental Management and Co-ordination (Water Quality) Regulations of 2006. This legal notice enforced by the National Environmental Management Agency (NEMA), seeks to prevent water pollution and outlaws such action.

NEMA, which is mandated to protect the environment, moved in to remove toilet structures in Mukuru settlement adjacent to the Ngong River. This was the case in Fuata Nyayo and Hazina villages (**figure 7. 20**). The mapping exercise did not anticipate this outcome but NEMA was able to obtain evidence of water pollution and was thus impelled to act upon the information to avert more water pollution. With no toilets the residents were forced to use other waste disposal methods such as the *flying toilets* and open ground disposal. According to focus group participants, using the mapping techniques, it was now possible to identify areas where flying toilets disposal methods were used in Mukuru. The participants were able to link the removal of physical toilets with the rise of flying toilets, thereby illustrating the potential of GI tools to assist stakeholders in addressing challenges in settlements.



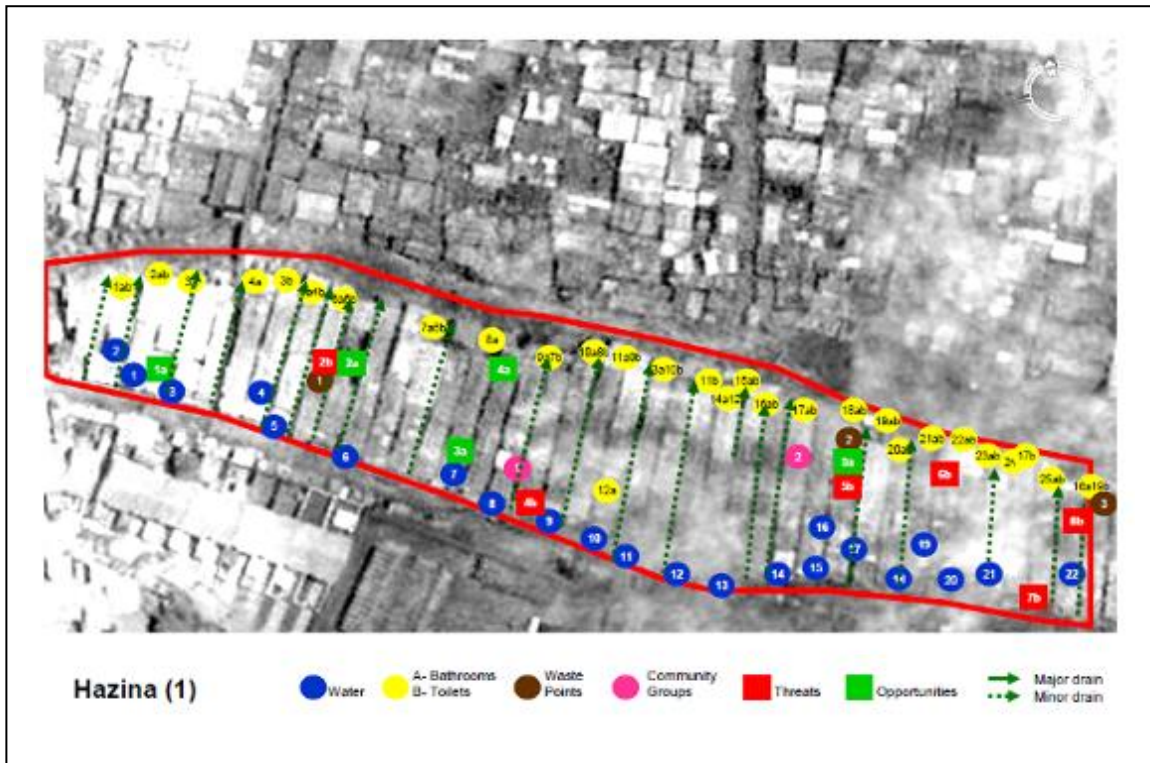


Figure 7-20 Location of Water and Sanitation Facilities in Hazina Village Source: Goal-Kenya



Figure 7-21 Toilet Structures Located Adjacent to the Ngong River Note the pipes emptying into the river



## 7.8 Discussion: A Sustainability Perspective

In all three cases, external actors (NGOs, international organizations and the government) played key roles in the upgrading process and also the introduction of GI tools. The communities in these cases did not champion the upgrading process (refer to Table 7.1) which raises questions with regard to whose project, whose data and whose agenda were concerned in the upgrading. This also leads to ethical questions, since the communities were not in full control or drivers of the processes. The key question is whether the communities were ready to engage in the upgrading process and related activities, including the use of GI tools. McCall (2003) and Chambers (2006) raise pertinent questions regarding the ownership of processes where GI tools are applied. They question the usefulness of the tools for better governance when communities are not in control of the tools and outcomes. If external partners control every aspect of the upgrading processes, participation by the community remains meaningless and can be viewed as an illusion of empowerment. It is therefore not sustainable planning practice for external agents to be in control of upgrading processes. This justifies the need to empower communities to manage upgrading process themselves.

In Korogocho, the data obtained from the mapping and enumeration exercise remains under the custody of the Government. This implies the community has no responsibility for the final outcomes. The approach to handling spatial and socio-economic data in Korogocho is not sustainable, especially if the community is to participate in decision-making processes. For the tools to make an impact within upgrading processes there is a need to embrace a decision integration rather than a decision support approach. Decision integration ensures community aspirations are captured and valued as opposed to decision support, where community views are not fully assimilated into the decision-making process. The question here therefore is whether the Government is justified in maintaining that the community cannot manage spatial issues data and ownership-related information, due to their sensitivity. The control of information by the Government will empower it, while disempowering the community and other groups working in Korogocho. This position is supported by others (Elwood, 2002; Harris and Weiner, 1998), who are of the view that GIS technology might empower some organizations and social groups but at the same time marginalize others.

Data from open data sources and Google Earth is readily available to communities in information-scarce settings. However obtaining remote sensing data from commercial satellite sources and aerial photography is normally expensive, and is therefore unsustainable or out of reach for many communities residing in informal settlements. Before the introduction of free and open source data, communities and the general public obtained spatial data from commercial agents, who charged high rates for it. This may partly explain why many settlements were not mapped and their characteristics remained unknown to the Government and planners.

The sectoral based approach in Mukuru where water and sanitation were the key areas of concern raises questions of sustainability. As opposed to the comprehensive approach taken in Korogocho and Mahira, the Mukuru project focused on water and sanitation. Informal settlements are faced with multiple challenges and hence the need to adopt comprehensive approaches to upgrading. GI tools are capable of providing data to address multiple issues within informal settlements, therefore development agents need to appreciate these capabilities and apply them to address challenges.

Mapping and enumeration led to conflict and tension within Mahira and Mukuru as demonstrated earlier. It was as a result of mapping that toilets located near the river in Mukuru were removed by the Environmental Agency. The enumeration and mapping in Mahira resulted in some structure owners losing their property to enable tenants to get a share of the land. Despite culminating in the equitable distribution of land between landlords and tenants in Mahira, the former felt that they had lost out in the process. The process of mapping in this case may be viewed with scepticism by sections of communities within informal settlements, especially landlords.

The key elements regarding the integration of GI tools in upgrading processes are summarized in Table 7.1. The summary and synthesis takes into account sustainability issues.

Table 7-1 Sustainability in perspective

	<b>Mukuru</b>	<b>Mahira</b>	<b>Korogocho</b>
The Tools and Complexity	Google maps: easy to use and comprehend	Aerial photos and GPS: easy to use and comprehend.	Aerial photographs and satellite imagery. Easy to use and comprehend.
Role of community	Key role in data collection owing to local knowledge and approach of Goal-Kenya.	Key role in data collection and verification.	Data collection, and verification of information.
Champion	Goal-Kenya	The Pamoja Trust	UN-Habitat and Government of Kenya
Data (Accuracy)	Objective: more illustrative and not focused on pin-point accuracy but providing approximate locations of infrastructure. Attribute data collected in collaboration with the community.	Accuracy important to determine area of village. Tenant and ownership details verified by community to ensure accuracy of details.	Good local knowledge of area ensures accurate data is captured. Sensitive nature of activity (land tenure) dictates accurate data collection and verification.
Appropriateness of tools	Google maps suited for identification of features. Feature identification hindered by lower resolution.	GPS tools suitable for collecting accurate data. Aerial photos suitable for identifying and ascertaining locations and providing evidence of settlement.	Images not current therefore new developments on the ground not included. Images are suitable as base data for mapping teams.
Scope of approach	Limited to environmental health aspects.	Comprehensive. Ownership and socio-economic data important for planning and advocacy	Limited to land tenure issues.
Potential for Replication	Approach replicable and suitable for small-scale interventions with low budgets.	Suitable where community has a common vision.	Suitable where concern is to address land tenure. Other settlements may be in need of infrastructure before addressing tenure or have tenure already.
Social transformation	Awareness raising and better understanding of challenges facing community. Enhanced opportunities for youth.	Enhanced awareness and ability to negotiate and advocate for tenure. Involvement of women in process.	Ability of residents to control process and demand tenure rights.
Conflict and tension	Information used to remove toilets and community left with no alternatives provisions.	Landlords with large parcels lost part of land.	Absent landlords may lose property. Structure owners do not support land allocation to tenants.
Ethical questions	Residents' identity not revealed or used to facilitate process	Residents details exposed to facilitate process of land distribution.	Structure owners' and tenants' details exposed to enable residents committee to verify their authenticity.

### 7.8.1 Upgrading without Geo-Information tools

This discussion focuses on what actors would be faced with if GI tools were not applied in the upgrading process. The focus is on what problems actors would face if the tools were not available. GI tools have been preferred because decisions related to both development and the environment are inherently grounded in the physical locations of key populations, resources, and issues (Brodnig and Mayer-Schönberger 2000). Furthermore, they are able to bring planners and decision makers into a better position to identify spatial inequalities and re-direct the allocation of scarce resources to those most in need (Masser, 2001:509).

*Problem identification.* GI tools offer unmatched advantages in terms of helping users identify challenges within informal settlements. Spatial models of settlements, for example, show settlement density and elements of congestion based on the number and size of structures. The research has demonstrated how the national environmental agency (NEMA) was able to identify toilets discharging waste into the Ngong River. This was possible after mapping existing toilets and the river. Without mapping and presenting the spatial location of toilets it would not be easy for the government or its agents to identify existing sources of water pollution. The use of remote sensing images obtained from Google Earth sources made it possible to present and identify pollution sources, an aspect which would not be possible without a spatial model.

*Analysis and quantification.* Mapping water and sanitation facilities in Mukuru, for example, enabled stakeholders during the community action planning workshop to point out areas that did not have access to basic infrastructure. Without the use of GI tools, such quantification and analysis would not be possible (refer to Section 7.5). Analysis in a non spatial environment may take a long time and can be an expensive undertaking. In Mahira, the City Council would not have managed to allocate land fairly among the residents if it had not been able to draw upon the accurate measurement and quantification of the area occupied by the settlement.

*Visualization.* GI tools offer better visualization opportunities to users. Without maps or images of the settlements, communities, development partners and Government officials would not be able to establish the physical extent of the settlements and their relationship with other physical and environmental elements. Non-spatial tools do not offer

visualization capabilities. This gives GI tools a distinct advantage over other tools. Visualization enables users to monitor change over time within informal settlements with ease. Without the tools it would be expensive to carry out such monitoring, given the dynamic nature of settlements. Limited usage of spatial tools would result in less information and thereby less empowered communities. The community's participation in planning and addressing challenges has benefited from the use and integration of GI tools.

Joshi, Fawcett and Mannan (2011:98) observed that a lack of knowledge regarding the existence of informal settlements had led to decision makers in an upgrading programme in India to ignore potential beneficiaries, despite initial intentions to include them.<sup>16</sup> The use of satellite images or aerial photographs combined with community enumeration would have ensured all settlements in question were identified and included in the programme. The Indian Government has since devoted resources to integrating GI tools to documenting all existing informal settlements for purposes of upgrading.<sup>17</sup>

### **7.8.2 Does technology drive society? A theoretical reflection:**

In Section 7.1, technological determinism is discussed in relation to the impact of the use and integration of GI tools in upgrading processes. From the study, it has emerged that social transformation took place as a result of integrating GI tools in upgrading processes. Communities were able to participate in decision making to address existing challenges within the settlements.

In Mahira for example, it was possible to map the entire settlement and quantify elements like population and settlement size using a combination of enumeration methods and GI tools. In Mukuru, communities were able to establish new ventures to address challenges like poor waste management and the lack of basic infrastructure such as water and

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<sup>16</sup> The Andhra Pradesh Urban Basic Services for the Poor (APUSP) programme documents conveniently justified the exclusion: "... a better targeting of poor is related to inadequate data: only notified slums have been included [in the APUSP] even though they form only a part of all poor settlements in a town.[In Andhra Pradesh] the practice is to carry out detailed surveys only in slums notified under the Andhra Pradesh Slum Improvement Act of 1956 (Government of Andhra Pradesh)." (Joshi et,al,2011)

<sup>17</sup> The Indian Government launched the Rajiv Awas Yojana (RAY) programme to map settlements in the country with the aim of making the country slum free. "Government plans remote mapping to get accurate figure of slum dwellers" *The Times of India*, February 11th 2010.

toilets. Youth groups were formed to collect waste and clean drains. Other community members were able to set up water kiosks to sell water to residents. These activities arose as a result of mapping the existing situation, which led to residents identifying gaps and areas requiring basic services. Technology here facilitated the community to access better quality information, which they used to make decisions aimed at addressing existing challenges.

However, critics of technological determinism such as Feenberg (2004) point out that as far as technology integration is concerned the most critical aspects include: who uses it, who controls it, what it is used for, how it fits into the power structure and how widely it is distributed. In the three case studies, external actors championed the introduction of the tools and in some cases, like Korogocho, have controlled what data to be collected and its eventual custodianship. Processes controlled by the community, including ensuring that data and information remains in public domain, are likely to have greater social impact. The case in Mahira where the Pamoja Trust handed over the data to the settlement committee for use in negotiating with the City authorities, clearly demonstrates the important role of the community and the Pamoja Trust's intention to empower it. There is a need to further explore and evaluate social transformation as a result of technological integration in upgrading processes.

Political and socio-economic settings play a key role in shaping technology and related tools. According to Winner (2004) what matters is not the technology itself, but the social or economic system in which it is embedded. In such cases, it is clear that the organizations supporting the upgrading activities understood the essence of integrating the tools. The government and UN-Habitat advocated tenant and landlord enumeration, since this information would be useful in determining how to allocate land to residents in the future. MacKenzie *et al.*, (1999) and Winner (2004) argue that the path of innovation and its social consequences are strongly, if not entirely shaped by society itself through the influence of culture, politics, economic arrangements and regulatory mechanisms.

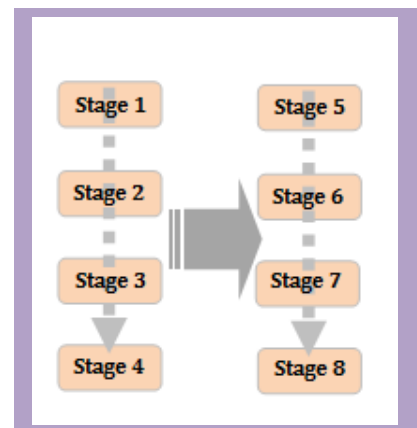
The residents of Korogocho formed settlement committees to manage the process of collecting spatial data for planning purposes. The community in this case had a role to play in determining the use of the tools and what data would be collected. In Mukuru, the community was tasked with mapping basic infrastructure and showing its status. Given these circumstances, it can be concluded that the social setting and organization of the community influenced the use and integration of the tools in the upgrading process.

## 7.9 Conclusion

The poor living conditions and lack of basic infrastructure in the informal settlements prompted a number of actors, including communities, to take action. The integration of GI tools was useful as it enabled the actors to better understand the dynamics and magnitude of existing challenges. Mapping the existing environmental health status in Mukuru enabled the actors to identify areas lacking access to basic services like water and sanitation. In Korogocho, through mapping and enumeration, it was possible to identify structure ownership details as well as the number of tenants. In essence this information was empowering to the communities, who had no previous idea regarding the infrastructure or dynamics existing in the settlement. The ability to obtain, analyze and visualize spatial and attribute data using GIS platforms provided decision makers with necessary information for planning. Satterthwaite (2003b), for example, pointed to the problem faced by planners and decision makers in meeting the MDGs by using unreliable data. He observed that many decisions which affected the way interventions were designed had actually been based on inaccurate statistics and data. In the end this had implications for delivery and meeting MDG targets in various countries.

There were other benefits which accrued to the communities following the upgrading activities. Social transformation, for example, was observed, where due to mapping activities the communities were able to use the information to engage authorities in the improvement of their living conditions. Mapping and enumeration activities enable communities to improve their status and that of their settlements.

The integration of GI tools is not without a downside. The tools led to disempowerment of those who were not able to use or access the information generated. Mapping and enumeration was similarly met with resistance by landlords, who feared it would lead to the loss of their property. In Mahira and Korogocho, structure ownership details were made public, which explains reservations by landlords. In Chapter 8, a responsive and inclusive framework is presented to show a sustainable approach to integrating GI tools in upgrading processes, drawing from the experiences discussed in Chapters 5, and 7.



## Chapter 8

A responsive and inclusive Framework



## Chapter 8: A Responsive and Inclusive Framework

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## **8.1 Introduction**

The research findings clearly demonstrate the potential offered by integrating GI tools in upgrading processes. The tools, it is anticipated, will provide a basis for inclusive and responsive approaches to addressing the challenges facing informal settlements. An ideal framework should develop the community's capacity to reveal existing challenges and provide avenues for active participation and engaging other stakeholders. The framework should support a process which engages communities from the inception stage, up to the implementation of interventions. Involving residents in mapping exercises presents an opportunity for them to contribute towards interventions as well as empowering them to get more involved in similar initiatives in the future (Cochran, 2009).

The framework should also provide an opportunity for all (including traditionally excluded persons such as women and youth) to air their views, provide data and integrate their voices in the decision-making process. A clear and transparent system should be developed to ensure that the data collected is a true reflection of the existing situation, captures community concerns and is not subject to abuse or misuse by others. Regarding applicability, GI tools should be able to support large-scale and small-scale upgrading processes equally. In this chapter, a framework that is both inclusive and responsive is presented. It is inclusive because it enables multiple actors to play significant roles, while at the same time providing a basis for these actors to address issues within the settlements.

## **8.2 The Elements and Key Characteristics**

The framework is based on the findings reported in Chapters 5, 6 and 7. In Chapter 5, the process of integrating GI tools in upgrading was presented. Chapter 6 demonstrated how communities participated in the upgrading process and reflected specifically on the impact GI tools had in the process. Chapter 7 showed how the tools were used to generate information and outputs that were applied to addressing environmental challenges within the informal settlements.

### **8.2.1 The upgrading process and integration of Geo-Information tools**

In Mukuru, the process began with community mobilization and the notification of the local administration of the intended project. This phase also included the pre-identification of

mapping teams and consensus-building which involved settlement elders and community development workers. The process involved collection of attribute data and mapping of water and sanitation infrastructure. This information was incorporated into spatial models which were used to support decision making during the community action planning session.

The Mahira upgrading began with community mobilization by the Pamoja Trust and Muungano wa Wanavijiji. After the initial mobilization phase followed a phase of village profiling and data collection. The data was used to develop a settlement database and profile which later underwent verification by the community. The final phase involved negotiating for land tenure and allocation to the residents.

The process in Korogocho saw the establishment of the Korogocho residents' committee, which was to be responsible for managing the upgrading processes on behalf of the residents. Other important phases included data collection, establishment of settlement and village boundaries and structure numbering. Satellite imagery was used to support the mapping, while technical support was provided by Government professionals.

### **8.2.2 Participation/actors**

In all three case studies, the community, local administration officials, central and local government authorities and NGOs played a key role.

In Mukuru the community supported the upgrading through their involvement in the mapping and data collection process. The community provided security and guidance to mapping teams during the course of their work. Active community participation was noted in the community action planning sessions where project prioritization and decision making took place. The community health workers played a key role in helping to collect environmental health data. Settlement elders and the area Chief, who are regarded as gate keepers, had a significant role where they had to sanction the proposed activities. In this process, Goal-Kenya provided support in the form of spatial data, training and eventually the construction of new toilet blocks.

Upgrading in Mahira saw the community (including women and youth) play instrumental roles in enumeration, mapping and measurements. Although many lacked technical skills,

the Pamoja Trust came in to provide the necessary support. Settlement elders were relied upon to assist in the verification of structure tenancy and ownership.

In Korogocho, key stakeholders included the community (including settlement elders), UN-Habitat and central and local government agencies. The residents' committee were composed of members drawn from the community. UN-Habitat provided spatial data, technical expertise and solicited donor support. The Government ministries (Local Government and Lands) provided technical support and represented Government interests in the upgrading programme.

### **8.2.3 Addressing environmental challenges**

While the cases had unique characteristics, the key objective in the upgrading process was to improve living conditions by addressing existing challenges. Poor infrastructure and environmental conditions justified the interventions. There is a crucial role for stakeholders (communities, NGOs, local authorities and central government departments) in improving living conditions in informal settlements.

Within Mukuru, Google Earth models were used to plot existing sanitation facilities. This process produced results which enabled Goal-Kenya and the community to gain a better understanding of the existing situation. Areas without access to water and sanitation were identified and interventions proposed to address the deficiency. Modelling the settlement and infrastructure status provided new information which enabled other stakeholders to participate in improving the environmental situation within the settlement.

Mapping existing structures within the Korogocho settlement enabled the residents and other stakeholders to identify structures that needed to be removed to pave the way for road expansion. This information was useful for purposes of negotiating with affected landlords for compensation or relocation. The upgrading programme aimed at addressing land tenure issues within the settlement. Mapping structures and enumerating ownership and tenants enabled the Korogocho residents' committee to identify absent landlords as well as tenants who had resided in the settlement for more than five years. A database of landlords and tenants was developed for purposes of documenting ownership and tenancy details.

### 8.2.4 Pertinent attributes

Key lessons from the case studies have been used to develop a framework for the integration of GI tools within upgrading processes. Lessons from the process (Chapter 5), stakeholder participation (Chapter 6), and addressing environmental challenges (Chapter 7) have been used to inform the proposed framework. A summary table (Table 8.1) is provided detailing key aspects with regard to the upgrading process, participation, and addressing environmental issues.

**Table 8-1 Key Attributes**

Mukuru	Mahira	Korogocho
<b>Process</b>		
<ul style="list-style-type: none"> <li>• Formalization of process by notifying settlement leadership</li> <li>• Formation and training of community mapping and enumeration teams</li> <li>• Community action planning (CAP)</li> <li>• Role played by NGOs is crucial</li> </ul>	<ul style="list-style-type: none"> <li>• Mobilization and sensitization of community</li> <li>• Vision building process with community</li> <li>• Information verification by community</li> <li>• Comprehensive approach to address tenure and poor conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Formation of residents committee</li> <li>• Settlement boundary delineation</li> <li>• Structure mapping and numbering</li> <li>• Information verification by community</li> <li>• Updating of data by residents committee</li> <li>• Key role of Government and international partners in large-scale upgrading programmes</li> </ul>
<b>Participation</b>		
<ul style="list-style-type: none"> <li>• Involvement of local administration officials and settlement leadership</li> <li>• Involvement of local expertise like community health workers</li> <li>• Involvement of community in technical and decision-making process such as CAP</li> </ul>	<ul style="list-style-type: none"> <li>• Inclusive approach with the active involvement of women and youth</li> <li>• Landlords and tenants are treated as equals</li> <li>• Community vital in the verification of data</li> </ul>	<ul style="list-style-type: none"> <li>• Democratic structures with the election of residents' committee members</li> <li>• Community, government and international organisations working together</li> <li>• Community involved in data verification and updating</li> </ul>
<b>Addressing challenges</b>		
<ul style="list-style-type: none"> <li>• Use of open spatial data sources (<i>Google Earth</i>) images for data</li> <li>• CAP to facilitate prioritization and allocation of resources</li> <li>• Responsive approach to address critical environmental challenges</li> </ul>	<ul style="list-style-type: none"> <li>• Comprehensive approach to secure tenure and improve services.</li> <li>• Land shared equally between landlords and tenants</li> <li>• Community involved in house and infrastructure construction process</li> </ul>	<ul style="list-style-type: none"> <li>• Local knowledge is important in process of developing settlement database on structure ownership and tenant details</li> <li>• Rapid implementation of interventions ensures community confidence</li> </ul>

### 8.3 An Inclusive and Responsive Framework

Integrating GI tools in upgrading processes will inevitably have both positive and negative implications. Whilst GI tools are associated with map creation, the process that leads to map creation is associated with collaborative planning (Schlossberg and Shuford, 2005). Mapping and associated processes may lead to change at local level, and help illuminate issues upon which a community may organize and take action (O'Looney, 2000; Talen, 2000). The tools, if used properly, can help communities make better decisions by enabling improved communication, analysis and visualization (Kingston, 2002; Al-Kodmany, 2000). As observed by Cities Alliance

*regarding enumeration, mapping and slum surveys [...] the key fundamental intention is that communities themselves, rather than third party professionals and development practitioners, collect information about their situation. They then use it to explore solutions and negotiate with relevant authorities. (Cities-Alliance, 2006: 24).*

NGOs and CBOs are expected to play important roles in upgrading processes. They are able to contribute towards needs identification, and mobilize and organize community participation. Faith-based organisations, for example, can play a consensus-building role while the settlement/community leaders organize and rally residents behind the upgrading project (Milbert, 2006).

The proposed framework illustrates the process of upgrading, the roles of key stakeholders and how GI tools can be applied. The framework comprises two distinct phases, which are in a sequence that corresponds with the conceptual framework developed in Chapter 2. The framework may be adaptable to many settings and upgrading programmes in Kenya and the regional context. However, it would be important to take into account the different socio-economic and institutional set-ups.

#### 8.3.1 Assumptions

The framework makes the following assumptions:

- 1. That legislation and policies supporting settlement upgrading will be upheld by stakeholders (organisations and communities) and the Government remains committed to addressing the challenges facing informal settlements.**

In Kenya, the National Housing Policy (2004) acknowledges the proliferation of informal settlements in urban and peri-urban areas, and the need to encourage participatory approaches to settlement upgrading. With funding from the World Bank, the Government is implementing the Kenya Informal Settlements Improvement Programme (KISIP) as part of the national strategy to address the challenges facing informal settlements. The successful implementation of this programme depends on the supportive role of stakeholders. The Government is expected to fulfil some of its financial and political backing obligations to ensure upgrading schemes meet their objectives.

**2. That community participation as envisaged in relevant planning policies will be encouraged and practiced.**

The active participation of communities in all stages of upgrading is important. The Physical Planning Act of 2008 provides for the public to be consulted and to participate in planning matters affecting them. The endorsement and sustainability of upgrading depends on support from the recipient communities and this can only be obtained if their involvement is factored in. Participation, it should be noted, is not always guaranteed. Within communities there exist divisions which hinder full participation of the parties involved. One such example is the tension between landlords and tenants. Either of these groups may decline to participate in upgrading if their interests are not taken into account. Healey (2003) recognizes the multiplicity of social worlds, including practices, and the complexity of the power relations within and between them.

**3. That the government and development partners aspire to meet development goals such as the Millennium Development Goals.**

Commitment by the Government and development partners to improving the lives of the urban poor is necessary if the framework is to be successful. Despite the global importance attached to meeting the MDGs, there are gaps in their delivery. Meeting these development goals requires financial and political support which has not always been forthcoming. This may be attributed to poor governance coupled with slow economic growth, political mismanagement and inefficient policy making (United Nations, 2007).

**4. That key stakeholders value the integration of GI tools in upgrading processes.**

Having the tools and integrating them in planning processes are two different things. The availability of free and open source platforms like Google Earth does not automatically imply that spatial planning activities will take advantage of them, and many do not. The dynamic environments presented by informal settlements require constant monitoring and accurate data if suitable interventions are to be developed. The lack of accurate data is regarded as an impediment to addressing challenges within settlements (Dupont, 2008; Satterthwaite, 2003b). This has led to a lack of action by planners and decision makers, as well as a misunderstanding of the complex environments within settlements. Tools like aerial photography or satellite imagery are capable of documenting the spatial dynamics of settlements. However, it is necessary to complement these sources with ground based surveys in order to ascertain the socio-economic attributes defining the settlements.

The proposed framework, which has two distinct phases, takes into account the following aspects, drawn from previous chapters; these are; 1) Participation, participants' goals and methods of engagement, 2) GI tools, data and information 3) Ethical considerations 4) Responsiveness and long term sustainability.

### **8.3.2 First stage**

*Step 1: Notification and justification.* This will involve presenting the upgrading proposal and related objectives to the community. It is important to use existing leadership structures to gain entry and sensitize the community. Integrating the local leadership makes it easier to sanction upgrading programmes. Integrating the community at this early stage is important since they are the intended beneficiaries of upgrading programmes. The building of a consensus ensures community support and the long term sustainability of the upgrading process. The potential role of other actors, including NGOs and the Government, is discussed in Section 8.4.

*Step 2.* There will be a need to establish a residents' committee, which will oversee the upgrading process. The committee is expected to serve as a link between the community and other external partners. The residents' committee will be expected to play a championing role in the process. This therefore requires the election of community members with commitment and community interests at heart. Members are to be elected



from all constituent sections or villages.<sup>18</sup> This will ensure equal representation in the committee. Tenants and structure landlords should be represented to ensure their unique interests are taken into account. Membership should include a mix of age and gender to represent the community. An ideal village committee would be composed of five members representing tenants, landlords, women, youth and settlement elders.

*Step 3.* Developing a base map covering the entire settlement will be important during the primary phase. Many settlements lack maps showing existing built form and infrastructure patterns. The role of Government, academic institutions, NGOs and other development partners is important here. The partners are able to provide spatial data such as satellite imagery or aerial photographs. Using local knowledge the community and settlement committee may delineate settlement and village boundaries for planning purposes. Using the same model, aspects of mapping such as the identification of existing structures may be undertaken. A structure numbering system may be developed for ease of identifying structures and matching this with socio-economic data to be collected at a later stage. The training of community members in the use of GI tools is necessary where such skills do not exist.

*Step 4.* Before the actual collection of socio-economic data, the sensitization of the landlords of the structures and their tenants to the survey needs to be achieved. This activity involves seeking the support and goodwill of the residents with regard to providing information regarding their setting and status. It is imperative that communities understand the need to present accurate information which will be used for decision making. The role of village elders and local administration is noted in this case. The type of data to be collected must be made clear to residents and the leaders.

*Step 5.* This stage focuses on establishing structures for attribute data collection. In this stage key activities include: developing data collection tools, as well as identification and training of data collection teams. Data collection tools may include check lists and questionnaires which address most of the socio-economic aspects within the settlement. The data collection team must be drawn from each section of the settlement. The mapping team composition should be localized to allow their local knowledge to be tapped. A deliberate effort should be made to ensure gender and age representativeness.

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<sup>18</sup> Informal settlements in Kenya in most cases have constituent villages, each under the control of a village committee.

### 8.3.3 Second stage

In this phase it is assumed that community structures are now in place, to manage the upgrading process integrating GI tools. The main activities include: data collection and analysis, output generation, feedback sessions, planning, and updating/sustainability issues.

*Step 1.* The settlement committee needs to open a register where settlement attributes are recorded. Data collection based on existing structures should be collected and entered into the settlement register. At this stage, the stakeholders will determine what data is to be collected. Some potential data that may be collected includes: household size and composition, structure/dwelling characteristics, infrastructure availability and potential risks and hazards faced by the household. However, it is important for the settlement committee to maintain a comprehensive register containing most if not all socio-economic aspects relating to the settlement. A comprehensive survey may serve multiple purposes aimed at improving living conditions within the settlement.

*Step 2.* Upon collecting the data, it may be stored in digital or analogue formats. The storage and control of information is addressed in Section 8.4. A GIS-based platform offers opportunities for spatial analysis and the generation of models which may be useful for planning and decision making within the settlement. NGOs and academic institutions may provide technical support in analysing and modelling spatial data. GIS tools provide platforms for the visualization of settlement dynamics, hence supporting decision-making processes.

*Step 3.* As in the Korogocho and Mahira cases, the data collected and analyzed needs to be validated by the community to avoid misreporting or distortion of information. For the community to develop trust in the process, it will need to be involved in the authentication of the data. Public feedback sessions provide transparent forums for verification and the approval of information collected by community members. It is during such sessions that data gaps are identified and where possible the situation is corrected.

*Step 4.* Upon approval of the information, planning sessions may follow. Planning will be supported by the information collected and analyzed earlier. The spatial information may provide insights into what, where and why challenges exist. The CAP process in Mukuru used spatial models to assist stakeholders in identifying which environmental challenges

to address. The visualization of the spatial patterns of environmental challenges provides new insights, often unknown to those living outside the settlements.

**Table 8-2 Responsibility and Level of Community Participation Matrix**

Phase	Activities	Community	Others	Participation Level
First stage (Primary)	Notification and information to community and settlement leadership	●	●	<i>Consult</i> <b><u>Low</u></b>
	Establishment of a sub-committee to implement the proposed scheme	●		<i>Empower</i> <b><u>High</u></b>
	Develop a base map and mapping facets	●	●	<i>Consult</i> <b><u>Low</u></b>
	Sensitization of landlords and tenants	●		<i>Involve</i> <b><u>Medium</u></b>
Second stage (Secondary)	Establish support structures for data collection	●	●	<i>Involve</i> <b><u>Low</u></b>
	Data collection	●		<i>Inform</i> <b><u>Medium</u></b>
	Data analysis and output generation	●	●	<i>Consult</i> <b><u>Low</u></b>
	Communication and feedback sessions	●	●	<i>Involve</i> <b><u>Medium</u></b>
	Planning and implementation	●	●	<i>Empower</i> <b><u>High</u></b>
	Updating and maintaining database	●		<i>Inform</i> <b><u>Low</u></b>

Notes:

1. Others includes NGOs, private sector and government ministries and departments which have a role in upgrading programmes
2. Communities may lack technical skills but will be consulted at the data analysis stage.
3. Communities should be responsible for maintaining and updating the settlement database. However, prior training is required to enable them to carry out this function effectively.
4. Participation levels are adopted from International Association of Public Participation (2006). They are: inform, consult, involve, collaborate, empower – with each succeeding level enabling participants to have increasing impact on the overall process.

## Secondary stage

## Primary stage

(Notification and justification, consensus building, planning of approach, community training, data collection,)

(Data collection, analysis, output generation, feedback session, problem identification, planning, and sustainability issues)

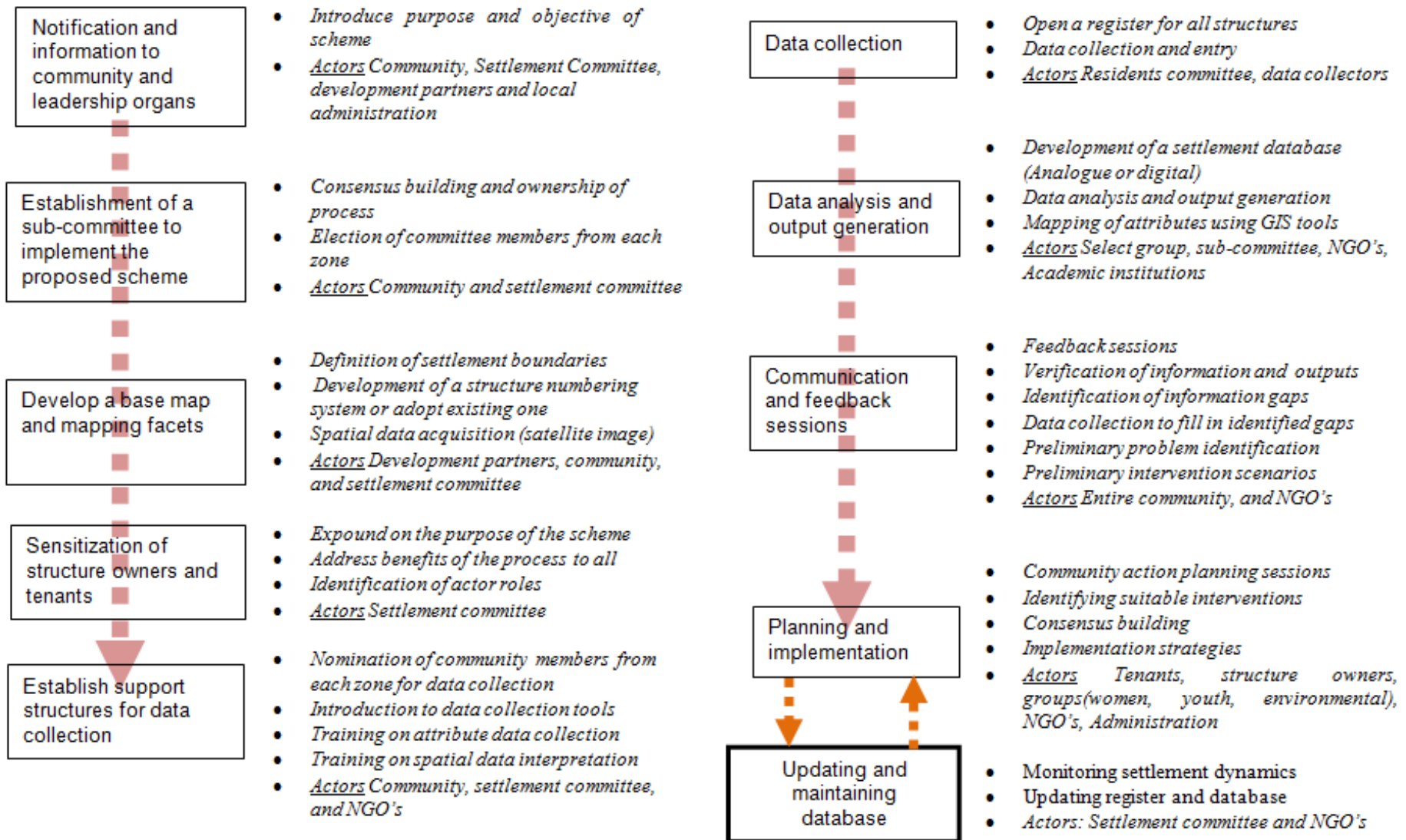


Figure 8-1 Framework for Integrating Geo-information in Settlement Upgrading Processes

## 8.4 Dealing with the Realities

### 8.4.1 Can the poor map?

By design, the process in the first phase starts with the notification and informing of the community about the intended activity. Gaining the support of the community is essential to ensure the long term sustainability of upgrading projects. As Ramasubramanian (2010: 152) observes: *“it was necessary to put the people first and the technologies to come later”*.

The community and its leadership need to have the confidence that they are the ones managing the process. Professionals and other actors should in this case provide support but they should not be seen to control the process. Despite the importance of integrating GI tools in upgrading processes, the primary objective should be ensuring that communities are engaged in the planning process from its inception to implementation. Patel (2004:123) maintains that settlement mapping and enumeration by organisations of the urban poor should be viewed as avenues for ensuring that these communities retain a central role in what is designed and implemented and how it is managed. Patel further maintains that community-led mapping and surveys were important in helping communities to look at their own situation, consider priorities, and articulate their knowledge to government and other organisations.

Enlightening the community on the intended intervention and approach may be necessary at the initial stage. This is where professionals play a key role. Not all residents may understand the need to have a GIS-supported approach, therefore a sensitization and education component may need to be factored in to ensure that all stakeholders appreciate the value of integrating GI tools.

The establishment of linkages between individuals and settlements will strengthen the capacity of communities to engage in GI supported processes. The Mahira community, for example, has since moved to support other settlements in mapping and enumeration activities within their upgrading programmes. Similarly the Korogocho upgrading programme has attracted numerous outsiders to support its technical aspects. This view is supported by Corbett and Rambaldi (2009:16), who maintain that mapping processes often attract outsider groups (including NGOs, community-based organizations, universities, and development agencies) that are usually strongly committed to the principles of participatory development and high levels of local community engagement.

They further observe that there is an absolute requirement that the roles of these outsiders should remain those of facilitators as opposed to those of 'experts'.

Through these linkages, training and information flows are made possible. These would help stakeholders understand and strengthen participatory processes. As observed by Rambaldi (2005:176), these linkages must be based on mutual respect, integrity, and trust.

#### **8.4.2 The role of other agents**

As mentioned above, the role of other agents such as NGOs should be a supportive one. It is evident that communities may lack some essential technical skills, which justifies the role of professionals and organisations, especially in mapping and enumeration activities. Using their networks and advocacy capacities, NGOs and CBOs are expected to negotiate with local, provincial and federal government representatives and agencies. Their other important roles include the mobilisation of communities (Huchzermeyer, 2009a; Hasan, 2006).

The potential role of these actors that has been described above is in spite of their inherent limitations in terms of capacity and limited access to spatial data, or technology to analyse the data. These limitations are likely to hinder the role of organisations in supporting communities to carry out activities such as mapping and enumeration.

The government and its relevant departments, such as the survey department, are ideally custodians of spatial data by law. However, this role is expected to change in situations where communities generate data regarding their settings. This may be data the Department of Survey may not have, or if it does, it may be outdated. Policy makers need to take into account the enormous potential of non-government actors to provide up-to-date spatial and even attribute data. Regarding the accuracy of the data collected by communities, government agents should be invited to ensure quality through verification mechanisms.

#### **8.4.3 Rethinking citizenship**

Carver (2003:65) maintains that participatory and community-led initiatives should do more than ensure the availability of spatial data used in the decision-making process.

Rather, the community should be regarded as a database in itself, and policy makers should integrate community knowledge in such a way that it leads to different solutions than might otherwise have been reached using purely traditional forms of data.

Central to the integration of GI tools in the upgrading process and planning approaches are the empowerment and engagement of communities. The deliberate engagement and participation of communities in planning leads to their empowerment (McCall, 2003; Chambers, 1997). Chambers further advocates active participation by communities and less control by professionals. As illustrated by global practice, the use of GI tools empowers disadvantaged groups such as communities of the urban poor, by enabling them to use the language and tools of decision makers and so influence events that affect their lives and environments (Hasan, 2006; Corbett and Keller, 2005).

Ultimately for empowerment and engagement to be realized, the following issues are worth considering:

1. Whether the process allows for people without formal education and professional expertise to participate. Urban poor communities may lack the necessary skills to use or apply GI tools. This was evident in Mahira and Mukuru settlements, where communities in the first instance did not have the skills to interpret aerial photos or satellite images.
2. Whether the process would allow meaningful participation by vulnerable members of the community such as older people, single mothers, people with disabilities, younger people/children. The role of women in the upgrading process in Mahira settlement shows the potential that vulnerable members of the community may have within development activities.
3. Whether the engagement procedure promoted discussion, free contribution and identification of solutions by the participating community. The case studies provided evidence of communities being called upon to verify the data collected and assembled into settlement databases. This approach illustrates support and recognition of the community's contribution to the process.

The situation presented above is likely to lead to a change in the balance of power within settlements. Previously powerful actors such as Chiefs and settlement elders may feel uncomfortable with the potential of empowering communities. Therefore, the role played by these leaders within settlements should be upheld and if possible enhanced to include

that of monitoring community-led initiatives to ensure the inclusiveness and integrity of activities such as mapping and enumeration.

#### **8.4.4 The scale and time frame**

Upgrading projects may take shape as large comprehensive projects, as in the case of the Korogocho upgrading, dealing with more than one aspect of community development, or small-scale projects focused on one or two aspects, as exhibited in the Mukuru and Mahira cases. Mahira presents a case of a small-scale upgrading project with a comprehensive approach. Besides improving the housing and infrastructure aspects, the Mahira project addressed the issue of secure tenure.

It is possible to integrate GI tools within small or large projects to help communities and development partners achieve desired goals. However, the implementation of smaller projects may require fewer resources than large-scale projects. Managing projects where large datasets are involved may present challenges to communities with less technical expertise. This calls for support from and collaboration with NGOs, development agencies or academic institutions.

Among other aspects, the implementation of the process depends on the availability of resources and the complexity of the situation. To avoid delays and conflicts, the involvement of the community, including its leaders, is emphasized. Importantly, communities should be allowed sufficient time to deliberate, negotiate and participate without duress.

#### **8.4.5 The post mapping period and sustainability**

Consequently, communities and development partners need to deliberate on the issues arising after the initial mapping. These include but are not limited to:

- Access to information,
- Updating of the settlement database in future
- Handling future needs and information requests for planning
- Sustainability of the process and data quality.



The framework supports the custodianship of information to be entrusted with the settlement committee. Having this sensitive information under the custody of the community will ensure the data is not misused or altered by outsiders. There is a need to take into account the potential for insiders to misuse the data, given the different interest groups within settlements. Full rights to access the data may be granted to the community, with only limited rights allowed to others from outside the community, unless their intentions are known to the community. Meeting this condition of good practice increases its cost and duration, but ensures that those who generated the spatial information are not deprived of their intellectual property and effort (Rambaldi *et al.*, 2006a). Multiple copies of settlement data need to be made available to government and non-government agents for storage and future reference. Challenges however still exist within settlements regarding the storage and security of data.

Responsibility for updating the information may be vested with the community, given their local knowledge and by virtue of their residence within the settlement. New developments may be plotted on existing maps or models held within the community. New structures, for example, may imply an increase in population numbers, information which needs to be updated in the settlement database.

It is expected that the community will support the process if tangible outcomes are realized. The long term sustainability of GI-supported upgrading processes depends on a collaborative environment and the responsiveness of the process in addressing existing challenges. In Chapter 6, the role of actors, including communities, was viewed as necessary to ensure that the integration and use of Geo-Information was possible. Development partners are likely to continue playing the key role of supporting communities with respect to capacity building and keeping abreast of emerging technologies. With regard to data quality, the collaboration of communities and other actors is vital, with each partner playing a checking and quality control role. Satterthwaite (2003b) warns against data and information which present a false picture of existing situations within informal settlements. It is imperative to have accurate information as the basis of the planning and decision making within the upgrading process.

Maintaining the community database and use of GI tools requires training and capacity building on the part of communities. Training on the use of tools is important given the evolution of new tools and planning approaches. The role of development partners, academic institutions and NGOs is important. For long term sustainability, the training of a

core group within settlements is envisaged to help build communities' capacity. The core group of persons may be used to impact skills within and outside the settlement, as need arises. Further training may be conducted with this core group who, in turn help to induct other community members. The lack of training and appropriate skills has been identified as a significant factor impeding the use of GI in planning, according to Gocmen and Ventura (2010:180).

## 8.5 The Ethical Questions

*Proponents of GIS technology, especially in socioeconomic applications, typically fail to consider the ethical and political questions that emerge as GIS institutions and practices are extended into socioeconomic domains (Pickles, 1995:17).*

Mapping and the application of Geo-Information in development processes is likely to influence both those who control and those who take part in using the tools, in essence determining the outcomes and power relations in society. This raises ethical questions about empowerment and ownership among practitioners and researchers in the Geo-Information realm, with regards to who is empowered or disempowered and who gains and who loses in the process (Chambers, 2006; Rambaldi *et al.*, 2006a). Abbott, *et al.*, (1998) further point out issues such as whose knowledge is expressed and who owns the maps as pertinent in activities which integrate GI tools. This section explores issues of misrepresentation of information and the invasion of privacy as a result of mapping or enumeration activities related to upgrading.

The proposed framework is clear on the issues of ownership, control and empowerment as a result of integrating the tools. Of importance is the deliberate attempt to have communities and their leaders take charge of the data and application of the tools, as well as the outputs of mapping or data collection activities. The outputs, for example, are meant for use by the entire settlement with the aim of improving existing conditions. Women, youth and otherwise less vocal sections of society are to be integrated by including their opinions into the decision-making process.

### **8.5.1 Keeping bias and abuse at bay**

Users and makers of GI technologies alike have been the subject of ethical and epistemological critiques. Inaccurate maps and data have often been used to mislead decision-makers and the public (Monmonier, 1996). Ethical problems are not restricted to the collection or mapping and presentation of data. Information about a community may be stored on spatially aggregated scales and be used to make decisions about the people within specific geographic units. However, this can lead to inaccurate conclusions, a consequence of the ecological fallacy (Crampton, 1995).

The Mahira and Korogocho case studies provide examples of good practice, where communities are called upon to verify information before it is used for decision making. Verification in the case of Mahira enabled residents to weed out intruders who wanted to take advantage of the upgrading scheme by having their names included in the settlement register. In Korogocho, the public is invited to verify the records of tenants and structures before the list is forwarded to the Government for planning purposes. These efforts by communities and leaders are meant to ensure that the data collected and presented is accurate.

Developing clear and transparent strategies at settlement and city level for data generated from the upgrading process to be available to communities provides checks and balances and guards against the misuse and abuse of data. The display and opening of a settlement register/database at village level enables Korogocho residents to verify details and point out irregularities, if any. The question of land ownership remains a sensitive one in Kenya, in common with many sub-Saharan countries, and is often the cause of conflict between tenants and landlords within informal settlements.

### **8.5.2 Invasion of privacy**

Sections of the community were opposed to mapping and enumeration owing to fears about disclosure of ownership details. This was evident in Mahira and Korogocho where landlords expressed dissatisfaction with the process and threatened to sabotage it. Spatial databases pertaining to structures and other developments in settlements were able to reveal the locations of properties owned by individuals who may otherwise have preferred to keep the information secret. Elwood and Leszczynski (2011:8) pointed out that spatial databases were bound to cause anxiety among communities, because data

associated with address, location or other geographic information may be assembled to reveal details about people who live at a particular place. The political and social implications of revealing such information within settlements necessitate the need to address privacy issues that arise from mapping or enumeration.

The objective of gathering accurate information regarding ownership is to enable decision makers to determine the status of landlords and tenants – for example, whether they are absent or present landlords, ownership and tenancy by gender and age – all of which are key population characteristics useful for planning. The fact that the spatial data is available to the community for verification and decision making has transformed the planning landscape. Previously disempowered groups become more empowered and information is no longer a preserve of the authorities. However, Harvey (2007) and Obermeyer (2007) suggest that these technologies simultaneously constitute new forms of surveillance, exclusion, and erosion of privacy, which have the potential to empower and dis-empower users.

Communities need to be informed of the need to develop settlement-wide databases for planning and decision-making purposes. Additionally, landlords and opinion leaders need to be integrated and informed of the strategic importance of developing settlement databases. Development partners and the government should not use the same information to harass or intimidate communities such as in the case of Mukuru, where toilets were demolished and no alternative provided. Trust between observers and observed needs to be established and translated into addressing existing environmental challenges within settlements.

### **8.5.3 Displacement of communities**

In the process of upgrading, displacement may arise – for example when affordability and tenure security have been undermined and access to a convenient location is lost (Huchzermeyer, 2008:26). New housing and infrastructure may be out of reach for many of their intended beneficiaries among the urban poor. This forces many to move out of their settlement in search of cheaper options. Unrealistic planning standards where upgrading proposals are guided by approaches used to plan formal areas may thus result in the displacement of communities. Urban poor settings may not benefit from such standards owing to low ownership of vehicles.

There is a need to minimize the resettlement of communities by exploring all viable alternative project designs, where displacement, and thus resettlement, is unavoidable (Burra, 2005:71). The ideal would be to develop resettlement plans which ensure displaced persons are compensated for their loss. GI tools may be used to identify a suitable location within or nearby for the resettlement of displaced persons. Additionally, the tools may be used to determine how many people are likely to be affected in the event of introducing new housing and infrastructure within settlements (refer to Sections 7.4.3 and 7.5).

## **8.6 Policy and institutional implications**

In Kenya, the Physical Planning Act (PPA) CAP 286, Sections 24 to 28, provides for public participation in the planning process. Procedures are set out for the preparation, consultation, approval and publication of plans. The preparation of renewal or redevelopment plans which are meant to address upgrading issues within informal settlements, requires the gathering of spatial and socio economic data. The collection of such data by communities will facilitate upgrading programmes initiated by development agencies and the government by providing necessary data. It is assumed this data will provide accurate information on the status of respective settlements and avoid an incorrect estimation of existing challenges. Data gathered by the Mahira community was used by the Nairobi City Council to plan for and allocate land to the residents. Similarly, the data collected in Korogocho will help the government to develop a framework for securing tenure and land allocation to tenants and landlords.

The community's role in participatory planning is also recognized in local authorities' service delivery action plans (LASDAP). The Ministry of Local Government provides for communities to participate in forums to develop local action plans. These plans are informed to a large extent by information brought forward by communities within the geographical areas served by the plan. The use of spatial-based information is important in planning forums, where it can be used to support decisions towards the allocation of resources. This is in line with targeting poverty where spatial maps are used by decision makers to identify areas of deprivation (Bedi *et al.*, 2007; Elbers *et al.*, 2007; Henninger and Snel, 2002). A collaborative approach is emphasized where communities and development agencies work together at different levels (settlement, city or nation-wide) in

collecting data on socio-economic status, with the objective of identifying pockets of poverty such as those portrayed by informal settlements.

Data collected and managed by communities has the potential to contribute towards their own areas and save development agencies and governments time and resources that may be employed to collect them. Currently, the Kenyan planning system lacks a comprehensive understanding of informal settlements. Information on their physical, economic, social and cultural characteristics is lacking, therefore collecting and disseminating this data to concerned partners is justified. The lack of planning action by the Kenyan authorities and development partners may be attributed to a lack of such information about informal settlements (Alder, 1995), as one among a number of factors, including lack of capacity.

Policy and legal frameworks should support a participatory approach towards building a comprehensive settlement database supported by GI tools. This would be the basis for formulation of policies, strategies and action plans for informal settlements. Frameworks are needed above all to support and institutionalise participatory approaches, implement agreed strategies, provide a model for replication elsewhere (since informal settlements are found in most urban centres) and build capacity within communities and professionals working to address challenges in the settlements.

## **8.7 Technology or the people? A Theoretical Reflection**

The process of upgrading follows a rational planning approach, which begins with a problem identification phase, and culminates in the implementation of agreed interventions or choices. Earlier approaches to planning gave planners broad responsibilities to manage the entire spectrum of activities, ranging from data collection, and analysis to the choice of the best alternatives for implementation.

The view presented above contrasts sharply with realities on the ground as portrayed by the three case studies, where all stakeholders including communities were involved in the planning process. Integrating all stakeholders in the planning process conforms with the collaborative planning approach advanced by Healey (1997). Healey's views are supportive of stakeholders' participation and reasoning in forums where debate produces knowledge. Inclusionary practices, as pointed out by Healey, are the hall-mark of collaborative planning approaches. The proposed framework in this research supports the

active role of communities and their leadership in planning processes. Participation is encouraged especially where processes impact on residents' environment and well being. This ensures community decisions are integrated through the entire process.

The proposed framework is defined by all stakeholders working within an enabling institutional and legal environment in Kenya. Healey described this as planning with a blend of soft and hard infrastructure. Within the soft infrastructure domain is the integration of stakeholder views in the planning process, whereas the hard infrastructure focuses on the necessary institutional, political and legal frameworks that support planning processes. Communities within informal settlements are able to initiate planning processes by collecting data on existing situations. This data may then be used to lobby Government and development partners for interventions. The data and information collected by communities regarding their own status may be used to challenge misconceptions about the settlement and communities. Healey supports the right to call Government to account and the right for all stakeholders to challenge decisions affecting them. Access to information by stakeholders is essential, in order to determine appropriate courses of action (Innes and Booher, 1999; Healey, 1997).

In summary, it is important for communities living within informal settlements to be recognized as dynamic multicultural entities, and to be involved in upgrading processes as early as possible. To this end they should be provided with the information and resources that will enable them to participate as 'real' and 'equal' partners (Maginn, 2007: 26). The role of information in participatory structures and processes and policy discourse is recognised.

## **8.8 Just Knowing and Understanding the Situation will not Make it Better**

In this chapter an inclusive and responsive framework which integrates GI tools was developed. It is envisaged that the process as described in this chapter will not end with mapping, but will take the map and the information a step further to make it useful and create an impact, such as influencing decision making. Stakeholders, communities included, are expected to use outputs such as maps and models to understand the challenges facing settlements and thereby act upon the information presented to them. The ability to present information to stakeholders' in a comprehensive and difficult-to

ignore-manner, makes it hard to overlook. Maps and spatial models are more concrete than words on their own, as they provide detailed geographical representations of settlement dynamics. The framework and inherent processes encourage participation and ownership by communities to address existing challenges within their settings.

It is proposed that communities are actively involved in processes leading to upgrading their own settings from their inception. The framework encourages communities to play important roles including decision making and planning. This is high-level participation as opposed to earlier top-down oriented models, which led to low-level participation or none at all. The framework goes further to propose that communities develop and maintain registers and settlement databases which may support future interventions.

The role of development partners is acknowledged in the framework. External organizations may support communities who lack technical skills which are required to apply GI tools. Communities may then proceed to apply the tools and even maintain systems such as the settlement database developed using the tools. These skills, coupled with information regarding their setting, empower communities thereby enabling them to address other challenges facing them. The post mapping period is crucial because communities are expected to update and maintain the settlement database.

Owing to dynamic settings experienced in the settlements, the regular updating of the database offers communities and development partners a reliable basis and information for further interventions. This aspect underpins the view by Patel (2004) that mapping and enumerations by organisations of the urban poor and the homeless are important in helping communities to look at their own situation, consider priorities, and articulate their knowledge to government and other organisations. For the framework to achieve the goals of inclusiveness and amelioration of the living conditions in the settlements, bottom-up approaches to development must be in place. According to Abbott (2003), spatial data management operated in the context of a people-centred approach provides the means to achieve this.

The framework takes cognisance of emerging ethical issues, relating to how the integration of the tools may disempower some actors. It also takes into account the possibility of abuse of information and invasion of privacy. In Chapter 6, the notion of access to information and its advantages was explored. Empowering communities with information, as outlined in the proposed framework, will enable them to engage in



decision making over matters affecting their lives. Technology here facilitated the community to acquire better quality information, which they used to make decisions aimed at addressing existing challenges.

Whether, in the final analysis, the technology can be said to have provided a platform for empowerment and addressing challenges within the settlements is a question that will be discussed in Chapter 9. The chapter will discuss the research questions and explore to what extent the findings provided answers to them. The implications for theory as well as planning practice and policy are examined.



# Chapter 9

The poor are on the Map

## **Chapter 9: The Poor are on the Map**

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## 9.1 Introduction

*Putting yourself on the map is the first step toward demanding recognition and everything that comes along with it – including basic human rights (the right to a clean living environment, the right to health) and by extension – the right to access services provided to the rest [...] young people are given the chance to represent their community through the medium of a map[...] and standard GIS symbols break down the barriers that separate youth and elders – rich and poor – and allow these young people to express themselves on a level playing field. Looking at the maps, who would know they were generated by youth from the informal settlements? (Health-Geography, 2011)*

Overall, this dissertation has examined a sequence of important interconnected issues: the process of integrating GI tools in upgrading activities, the participation and roles of stakeholders, including communities, and how GI tools have been used to address some of the existing challenges within informal settlements.

First, the ‘how’ aspect was examined. In chapter 5, the study outlined the process and steps communities and development partners had taken with regard to upgrading and how GI tools were integrated therein. The study examined three cases within informal settlements in Nairobi, each involving stakeholders with diverse characteristics. The processes exhibited different approaches and objectives, but largely adopted the rational model of planning which sets its focus on a contemporary issue and follows through to identify solutions or interventions to address the challenge identified initially.

Second, the ‘who’ question was examined through the various roles played by stakeholders in the upgrading process. Chapter 6 discussed the use of GI and explored how this enhanced participation, especially the participation of communities within informal settlements. The integration of GI tools had a significant positive impact, enhancing participation by communities in planning and decision-making processes. Community participation in terms of collecting data, developing community-wide databases, and using the outputs for decision-making purposes was examined. The outcome was more empowered communities who were able to participate in decision-making processes owing to the availability of the information they contributed to their construction.

Third, the why or justification for the integration of GI tools was explored in Chapter 7. The basis for integrating GI tools in upgrading processes was to assist stakeholders in

improving their understanding of the magnitude of the challenges, and quantifying them. It is widely accepted that developing appropriate interventions within informal settlements requires a basis of sufficient, accurate and up-to-date data and information. The integration of GI tools in this case helped meet this objective, thus furnishing the concerned parties with a solid base upon which to address issues such as environmental challenges within the settlements.

Key findings were used to develop a framework for the integration of GI tools in upgrading processes, a framework which offered inclusive and responsive capabilities. A responsive and inclusive framework is presented in Chapter 8. It provides for participatory and timely approaches to addressing challenges, to ensure communities and partners alike are included in upgrading and planning activities.

This concluding chapter starts by revisiting the research questions. Here a reflection is made of the regarding the findings and how well they answered the questions pertaining to each chapter. The chapter also presents theoretical and methodological reflections where existing literature and concepts are reviewed and their significance explained. The thesis makes recommendations for further research based on the gaps identified and other unexplored but potentially important aspects associated with the research themes.

## **9.2 The Research Questions Revisited**

### **9.2.1 The upgrading process and integration of Geo-Information tools**

*How useful were GI tools to the upgrading process?*

The need for accurate information is particularly valuable for policymakers and communities alike, engaged in designing upgrading interventions and planning for service provision. Similarly, the requirements for spatial information in the upgrading process justify the adoption of GI tools (Acioly, 2009; Abbott, 2003; Sliuzas, 2003). The conceptual framework presented in Chapter 2 illustrated the need for information, including spatial information, to quantify existing challenges within informal settlements. In the three cases, spatial information was used to set the ground for interventions. GI tools were applied to help communities and partners visualise and quantify existing situations with the aim of proposing interventions and measures to alleviate problems.

Analysis of the case studies shows that the integration of GI tools in upgrading programmes was a deliberate strategy by the key stakeholders (government and non-governmental organisations). The inherent advantages of integrating GI tools were obvious to the development partners, hence justifying the action. The approach taken by the development agencies points at a rational approach, which is guided by gathering, quantifying and measuring empirical data, before developing interventions to address existing problems.

The consequence of providing spatial data and information to communities was democratizing information, whereby previously less informed communities were provided with access to information which increased their empowerment in the upgrading process. In Mukuru for example, the use of open sources such as Google Earth, enabled the community to equally identify challenges and opportunities which led to the transformation of the settlement planning and socio-economic landscape. In Kenya, before the introduction of open sources of spatial data, the only available sources of data were the government or private sector who charged high fees for the data. Access to Government sources of data required a lengthy transition through bureaucratic channels, which could frequently be time-consuming and expensive for the ordinary person. Through the introduction of open sources, such as Google Earth, communities have a quick, low-cost way, of visualising and understanding their environments. However it is important to note that spatial data and tools can only make sense if there is a felt need within the community to address challenges, and a willingness by communities to participate in addressing these challenges, and, sometimes to work with partners to support interventions.

The manner in which GI technologies are designed, integrated and disseminated within upgrading programmes has social, cultural and political consequences, with both negative and positive implications (Ramasubramanian, 2010; Corbett and Keller, 2005; Craig *et al.*, 2002). GI tools are able to convey details to outsiders and offer communication links between stakeholders and communities who share similar development interests. Enabling communities within informal settlements to manage the process of developing settlement-wide databases has resulted in a shift of power and the empowerment of less powerful individuals. In Mukuru, for example, when the open spaces had been mapped, the community was able to lay claim to them and propose new uses for them. In another case, Mahira, where formerly, the Chief had been responsible for allocation and use of

land within settlement, it became possible for the community to take up the responsibility of determining how much land each resident (tenant and landlord) would get. This was facilitated by the mapping and quantification of the area covered by the settlement. The availability of key information, as demonstrated, is capable of distorting the power dynamics within communities. This power over knowledge, if well managed, can result in the true ownership and management of upgrading processes by communities. Luna *et al.*, (1994) point at the importance of power and control by communities if upgrading programmes are to succeed. The research demonstrates how the availability of information can enable communities to have control over matters pertaining to their settings.

The integration of GI tools opened up new avenues and opportunities for communities within informal settlements. Both horizontal and vertical linkages were established within the Mahira settlement (Section 5.4). Households were able to get to know each other better and in time, entire settlements were united by the common objective of upgrading. Individuals who initially had little knowledge of their settings were able to enhance their networks and understanding through mapping of their immediate surroundings and the entire settlement, as discussed in Chapter 6 (section 6.7.2). During the verification exercises in Mahira and Korogocho, the community was presented with the opportunity to know who the tenants and landlords identities. Similarly, through mapping of settlements, communities were able to establish links between various elements existing in their environment. Mapping water and sanitation in Mukuru, for example, enabled the residents to link the issue of flying toilets with areas where toilets were not available. Mapping also led to the identification of areas where water supply was limited, thus prompting residents and community groups to invest in new infrastructure, such as water vending points. Subsequently new ventures were started which had a positive bearing on people's livelihoods and also led to social transformation (Chapter 7).

However, the process of mapping within upgrading processes also led to conflicts, as well as developing mechanisms to resolve them. In Mukuru, mapping the existing toilets led to conflicts between the Environmental Protection Agency (NEMA) and the landlords whose toilets discharged directly into the nearby river. Similarly, conflicts were observed in Korogocho, where landlords were opposed to the mapping of structures, as this would reveal their status and the amount of properties they owned. In the case of Mahira,

enumeration and mapping meant that tenants and landlords were treated as equals when it came to distributing the land resource.

### **9.2.2 The integration of Geo-Information tools and participation by communities**

*How does integration of GI tools support all-inclusive participation in settlement upgrading?*

This aspect of the study set out to explore whether the integration of GI tools in upgrading processes helped to develop platforms for inclusive participation in decision-making and the improvement of living conditions within informal settlements. The central focus was on communities living within informal settlements and whether they were able to map or use geo-spatial tools and information for planning. Questions were posed as to whether communities were able to participate meaningfully in processes involving complex tools. This prompted questions on whether the poor could map.

Involvement by communities in upgrading processes where GI tools were used was summed up under the rubric of 'community participation'. The cases studies demonstrated that communities were capable of performing simple to complex tasks involving the use of GI tools. Unlike planning approaches, which are top-down oriented and largely in the control of the technocrats, the three case studies displayed communities as active participants, having control over some of the processes. In the cases of Mukuru and Mahira, the communities were actively involved in making community-based databases, which were used for developing interventions. In the case of Mahira, the community went further, using the outputs generated by GI tools to negotiate secure land tenure with the City Council of Nairobi. This may be termed as high-level participation in decision making. Similarly in Korogocho, the community has been involved in collecting data and using it to develop a settlement-wide database which will eventually be used to allocate the land resource. The integration of GI tools provided communities with avenues to participate and exercise control in decision-making processes (Section 7.4).

The poor can indeed map. In Section 6.3, the research shows how the use of geo-tools enabled younger people and women to participate. Ordinarily this group of people would be underrepresented or left out of planning forums. In all cases, for example, there was youth involvement in enumeration and mapping activities. In Mahira, women were



involved in enumeration and negotiation activities. The realization of the potential of women and youth by development partners and settlement leaders resulted in their inclusion in settlement planning committees in Korogocho. An analysis of the mapping teams in Mukuru showed that more than 50% of the mapping teams were composed of women.

*Small is beautiful*<sup>19</sup> as Schumacher (1973) pointed out. Small-scale upgrading activities such as the case of Mukuru, where simple and easy to use tools like Google Earth maps were applied, enabled community members and mapping teams to produce spatial models of their areas for planning new infrastructure. Large-scale operations like the Korogocho case involved the use of complex spatial analysis and mapping software, which the communities had no experience of nor skills with using. This does not, however, imply that large-scale upgrading processes would not also be able to rely for their operation on simple GI tools .

Participation, especially in decision-making processes, as demonstrated in Mukuru and Mahira, is highly dependent on the availability of information. Being in the information shadow (section 6.7, barriers to participation), meant that residents were not in a position to understand what transpired beyond their households, let alone the settlement. As expressed by an elder from Mahira:

*Enumeration and mapping the village made me known by all people. Initially I would be confined within my house and have little to do with the outside world...today ask anyone and they will bring you to my house. Susan, Settlement elder, Mahira.*

Undoubtedly, being in an information shadow restricted people's knowledge and participation in matters that affected them.

Barriers still exist at the settlement and national levels which hinder effective participation and the integration of GI tools in upgrading processes. Power structures within settlements hinder residents from exercising full control in upgrading processes. By exercising control over enumeration and mapping activities, settlement leaders are able to control what is mapped and represented as the existing situation. In many instances,

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<sup>19</sup> The phrase "Small Is Beautiful" is used in support of small or appropriate technologies that often have the potential to empower people. This is in contrast with the phrase "bigger is better".

settlement leadership is in the hands of landlords rather than tenants, who are the majority in the settlements. This explains why in Korogocho, the enumeration and mapping process has faced opposition from landlords (Section 6.3). The fear of losing their property and economic power compels landlords to display such resistance. At national level, government and city authorities have shown little support for community-initiated processes which are likely to result in the empowerment of residents. This was demonstrated in the case of Mahira, where the City Council of Nairobi was reluctant to grant secure tenure to the residents. Satterthwaite (2010) observes that many governments have still not fully accepted upgrading initiatives. Some governments with strong pro-poor programmes such as South Africa have only recently endorsed upgrading, due to the fact that the first democratic government initially assumed that it would be able to solve the housing problem by supporting new housing construction for low-income groups.

### **9.2.3 The integration of Geo-Information tools to address challenges**

*How do GI tools provide platforms for addressing challenges in settlements?*

GI tools are integrated in upgrading processes with a view to providing an understanding of the highly complex, high-density squatter developments, which would otherwise present challenges to planners. Mapping and enumeration are an essential part of any upgrading programme, especially when there are no official maps or data on households in the settlements that are to be upgraded (Karanja, 2010). The integration of GI tools therefore has to support this process. The tools should be regarded as capable of enabling local authorities, communities and professionals to work in interactive ways to address the multi-faceted nature of informal settlement (Abbott, 2003).

The use of GI tools in planning and upgrading the informal settlements offered stakeholders the opportunity to take an inventory of spatial realities and to link these with data from households and other surveys. In Korogocho, data from structure mapping was matched with ownership and tenant details to provide a realistic picture of who owned what, where. In Mukuru, the visualization capabilities offered by GI processing tools

enabled communities and authorities alike to understand settlement dynamics, such as areas in need of services like water and sanitation (Section 7.4).

The process of building the case and addressing environmental challenges necessitated an approach and tools which offered accurate and reliable information. Having to deal with a myriad of challenges, characteristic of informal settlements, stakeholders opted to adopt mapping tools which captured multiple issues. Mapping using Google maps presented near-impeccable information and helped in unmasking the challenges existing in the settlements. Visualizing structures that need to be removed to pave the way for road expansion in Korogocho, and the mapping of toilets discharging directly into the river, presented stakeholders with much-needed information for decision making. As demonstrated in sections 7.3 and 7.4, accurate information and quantification of challenges facing settlements enabled stakeholders to design appropriate interventions.

Satterthwaite (2003b) points to unreliable data and statistics which he maintains hinder governments in developing countries from understanding the real challenges facing the large numbers of their population living within informal settlements. As presented within this section, integrating GI tools in upgrading processes enabled stakeholders to gather and analyze spatial data which was reliable and useful for developing interventions.

Additionally, mapping and enumeration activities resulted in social transformations within the settlements (Section 7.6). In Mukuru, the mapping exercise revealed hitherto unknown opportunities to the community that were particularly advantageous to the youth. Opportunities for supplying water and building new toilet facilities were identified within the settlement. The collection and sorting of garbage in the identified open spaces provided new opportunities for unemployed youth from the settlement. The research showed how youth groups such as the Nairobi South Youth Group and Environmental Youth Against Crime were formed after the mapping exercise to collect solid waste from households within Mukuru settlement. The community in Korogocho similarly experienced social transformation as a result of integration of GI tools in the upgrading process. The mapping of structures and collection of other spatial data was carried out by teams of male and female youth. This enabled them accurately to ascertain the status of their neighbourhoods, alongside employment and income information. Upgrading processes that lead to physical change within informal settlements need to aid the broader social transformation of the settlement. Importantly, the needs of both the settlement as an entity

and those of individuals within it are important and need to be taken care of during the upgrading process (Imperato and Ruster, 2003; Abbott, 2002b).

Notwithstanding the advantages associated with integrating GI tools in upgrading processes, they were also observed to provoke some unexpected occurrences. Mapping structure ownership details did not sit well with landlords in the Mahira and Korogocho settlements, who saw it as infringement into their privacy and social life. Their reaction is to be expected, given that some of the owners were absentee landlords as well as in positions of leadership. Details of conflict and tension are provided in Section 6.7.3.

#### **9.2.4 Ethical implications**

*What are the ethical implications of integrating GI tools in upgrading processes?*

The impact of spatial information technologies on participation, power, knowledge, politics, and privacy are well documented (Elwood, 2010; Perkins and Dodge, 2009). The integration of GI tools in planning processes raised ethical concerns within and for communities, especially with regard to the process and participation (Chambers, 2006; Osrund, 1995). The tools were intended for useful purposes such as improving planning by providing stakeholders with better information regarding their settlements. However, the use of these tools, it has emerged, raised ethical concerns identified in the study that relate to transparency, privacy, ownership, the control of data and the mapping process, informed consent and sensitization, conflict and (dis)empowerment. These are discussed in detail in various parts of the thesis (Sections 5.6, 6.8 and 8.5).

A section of the communities within informal settlements, especially landlords, were opposed to mapping and enumeration activities, since these would reveal their identities and wealth status in the settlements. Their resistance is understandable, given that some of these landlords are leaders and influential people within their own society. Some may have used their positions and status to occupy land within the settlements and construct structures for rental purposes (COHRE, 2005b; Syagga *et al.*, 2001). While mapping and enumeration enables residents to obtain detailed information on structure ownership and socio-economic dynamics regarding their settlements, this was viewed by some landlords as an invasion of their privacy. Enhanced transparency created by providing ownership details is a key ingredient towards sustainable upgrading yet, as presented above, it met

with opposition from those who had reasons to remain anonymous. Similarly, part of the community in Korogocho, for example, felt that the numerous data collection activities conducted by different organisations made them feel too exposed, while others felt over-researched. The numerous data collection exercises within informal settlements may lead to communities feeling over-researched and exposed, thus leading to ethical concerns as discussed in Section 6.8.

The introduction of GI tools is mainly championed by external organisations because communities within the settlements may not have easy access to these tools. Questions arise regarding the ownership and control of the tools, and of the data obtained using these tools (Chambers, 2006). The data to be collected was in all the cases determined by the organisations supporting the upgrading process. However, it was the communities who were actively involved in collecting the attribute data used for planning purposes. Thus, there is a basis for arguing that the organizations involved were controlling the process by determining the data to be collected and providing the tools for analyzing the data. In this case, the upgrading agenda reflected the wishes of the external partners. However, in Korogocho and Mahira, the community has been involved in vetting the data collected before it is used for planning purposes. This gives the community an upper hand in determining the outcome and mapping process.

Mapping activities, as observed in previous chapters (Sections 5.6 and 6.7), could result in conflict between the actors involved in the upgrading process. In Mahira, for example, tension arose between tenants and landlords over the registration of structures, with both parties claiming ownership. Despite the good intentions behind the upgrading process, conflict could arise between actors where the changes introduced led to the disruption of the existing status. Pickles (1991) and Schuurman (2000) alluded to the fact that GIS has the potential of being used as a surveillance technology, thereby leading to mistrust from the public.

### **9.3 Theoretical Implications**

How do the findings of the research relate to the theoretical ideas presented in the literature review?

The research focused on three key aspects regarding integration of GI tools in upgrading namely; the process, the participation and addressing challenges. The objectives of

upgrading are to improve the physical (infrastructure) and socio-economic (livelihoods) conditions within informal settlements. To achieve these objectives, information regarding the existing conditions is required by stakeholders for planning purposes and designing interventions. This justifies the use of geo-spatial tools to provide in particular spatial data regarding the settlements. The process of upgrading, as demonstrated in Chapter 5 (Section 5.2), follows a rational approach which proceeds from the premise of problem identification to problem solving by way of designing suitable interventions. The role of power structures within the upgrading is crucial and defines the path to meeting upgrading objectives. In Mukuru, for instance, Goal-Kenya initially approached the settlement leadership and area Chief to notify them of their intention to work within the settlement. The same settlement leaders were approached to help the community and Goal-Kenya identified areas suitable for the construction of new infrastructure. In the planning phase, where the community action plan was developed, settlement leaders and community representatives were involved in prioritizing interventions and in the allocation of resources. This case confirms the importance of power structures within upgrading processes. By contrast, the rational approach does not take into account power structures and how these can affect or support upgrading or general developmental processes.

With reference to Faludi's model (section 2.6.1), the upgrading process within the cases observed started with the recognition of discrepancy between desirable and current conditions. The various organisations involved and communities initiated the upgrading processes to address existing challenges consequently improving the present state of living conditions. The first step in decision-making processes is characterized by the identification of potentially actionable cases. The intervention by organisations meant that they had the resources to support the initiatives. These resources also included the goodwill of the host community. The assumption is that the communities were willing to work with external actors or organisations in upgrading which is not always the case. A hostile environment would provide challenges to organisations engaged in upgrading activities. Boonyabanha (2005:44) sees this as not unusual because informal settlement dwellers experience hostility from their surroundings and are regarded as illegitimate citizens. This is further supported by Fainstein (2009:108), who observes that the rational model did not take into account political conflict or the specific terrain on which it was working.

The upgrading process could be said to simultaneously empower and disempower different community members. Those disempowered included Chiefs and settlement leaders who, initially before the upgrading, had authority over developments within the settlements. In Mahira, residents had to obtain authority from the area Chief to construct new structures. With the upgrading project all this changed and the community was now able to control how much land each resident would be allocated to construct permanent housing. The above circumstances explain the opposition to upgrading and even to the integration of GI tools, given the implications for existing power structures and infringement on individuals' privacy. As demonstrated before, the integration of geo-spatial tools has elicited resistance from those who feel their privacy is being infringed or even fear a loss of power and influence.

Information and tools that help provide information are important in upgrading processes. In theory, GI tools are able to convey details to outsiders and offer communication links between stakeholders and communities who share similar development interests (Ramasubramanian, 2010; Corbett and Keller, 2005). However criticism levelled at GI-supported approaches views the tools as likely to enhance social and geographical inequality, owing to unequal access to the technology. Pickles (1991) argued that GIS only helps to facilitate practices favouring those with access to the technology. The research demonstrated that even those without the skills and knowledge to apply the technology were empowered. Residents in the settlements were able to connect with the outputs and participate effectively in decision making. The impact of visualisation and the display of settlement characteristics may be illustrated by these cases.

### **9.3.1 Whose map? The process and the product**

At the end of the process, maps were produced showing the settlement and its attributes. According to Chapin (2006:95), maps are more than pieces of paper with lines drawn on them. They are powerful documents and serve numerous purposes, including a political function. With this in mind the process engendered a certain sensitivity, especially among the communities being mapped and the government authorities or mapping agencies. The communities would be apprehensive of the mapping process and who might control or own the outputs. On the other hand, if communities took up mapping activities, the government officials would view this as a potential threat or part of a campaign for land

rights or empowerment. Indeed, in the case of Mahira, the City authorities and area Chief did not support the mapping initiative as they saw it as a campaign by the community and the Pamoja Trust for land rights. In Korogocho, the government allowed the community to participate in mapping activities, but only under the guidance of the Ministry of Local Government and planners from the Physical Planning Department. This demonstrates the importance of control over the process and outputs.

Maps as observed by Harley (2009:130) are not value free and are a way of representing the human world which is biased towards and exerts influence upon particular sets of social relations. This makes it possible to understand the need for their control how appropriate they are to manipulation by the powerful in society. Making and using maps in a socially constructed world is associated with power and control. Integrating GI tools within upgrading processes enabled less powerful actors in this case the communities to express their needs through spatial models. Using these models communities brought to light challenges facing them consequently provoking action by the government and other stakeholders.

Maps and associated products have also been used especially by governments to maintain control over the public. Foucault (2007) put forward the concept of governmentality, perceiving there to be a close relationship between mapping and government and the need to manage space. He argued that Government-led practices such as mapping, census, or enumerations were aimed at defining and regulating the population. Foucault saw the close relationship between space, knowledge and power thus making them impossible to understand separately. As demonstrated in Chapter 6, the issue of existing power structures, control over land, and how information obtained from mapping and enumerations empowered and disempowered different people in the settlements, affirms Foucault's position on governmentality. The Kenyan Government through various ministries (Lands and Settlement and Local Government) is actively involved in the Korogocho upgrading programme mapping process. This may be interpreted as a way of ensuring control and maintaining power structures. Ultimately, the Government will allocate land to the residents of Korogocho who have been mapped and enumerated. Controlling these activities ensures legitimate members will benefit from the upgrading process.

Emerging trends towards information volunteered by the public has led to a situation where this is an increasingly accepted source of data. It is no longer a question of who



owns the mapping process, but what information is provided and how it is presented. Communities worldwide, regardless of their setting, are able to supply information on their environment. Open sources and the web have transformed the entire mapping and access to information landscape to ensure that even those who have limited technical skills can easily have access to information. The overall impact of the initiatives points at communities being able to control development processes or decisions concerning their environment. The ability to highlight existing challenges through mapping and communicating them using web-based technologies, ensures that all stakeholders are aware and empowered in the process. The web cuts across cultural and gender barriers that may exist within a setting, thereby empowering previously marginalized sections of the community such as the urban poor.

### **9.3.2 The process, participation and the product;**

Community participation has many meanings and is a term that is, after all, an ideological one. According to Nelson and Wright (1995), the ideological bases of these concepts were derived from theories about “how society is organised and how it can be changed”: society signifying ‘stake holders’ and ‘change’ signifying ‘transformational’. Participation in planning discourses is often discussed in association with the involvement of communities in the planning and implementation of, for example, neighbourhood design, urban upgrading and renewal. The main focus of this concept is the active participation by grassroots communities in developing partnerships with other stakeholders, such as government, non-governmental organisations and development partners. The community in this regard is viewed as the end user and therefore deserves more control of the what is happening within their settings (Hamdi, 1995).

McCall (2003) offers a spectrum for evaluating participation, with facilitation at one end, empowerment at the other, and mediation and collaboration somewhere in the middle. Schlossberg and Shuford (2005) theorized about how the way that different public groups intersect with different types of participatory processes poses different requirements for technological support, including GIS. They developed a meta-domain matrix of public and participation. From simple to complex, their matrix was constructed through a flow of domains: inform, educate, consult, define issues, joint planning, consensus, partnership, and citizen control.

Evidence from the cases showed that communities participated at different times and that various forms of participation were involved. In the earlier stages of the upgrading process, community involvement was observed which symbolised endorsement, support and collaboration of the intended upgrading activities. The community also supported mapping and enumeration activities and this may be interpreted as community investing their own resources to support the upgrading process. The mobilisation of resident representatives to participate in the community action planning sessions and presentation of the settlement plan to the City Council to advocate for secure tenure shows potential and commitment to take up high level decision-making roles previously a reserve of NGOs or CBOs working within settlements. This indicates a change in the approach towards and meaning of participation where the disadvantaged and excluded urban population take up higher participatory duties.

Collaborative planning approaches provide the theoretical and methodological framework to explore inclusive arguments and partnerships in the research. The study observed that through partnerships, stakeholders, especially communities, became aware of their environment and the challenges facing them. These elements are characteristic of Participatory GIS (PGIS) and Public Participation GIS (PPGIS) approaches. These approaches are seen to empower disadvantaged groups by enabling them to use the language and tools of decision-makers, and can help people make better decisions by enabling improved communication, design and analysis, thereby influencing events that affect their lives and local geography (Corbett and Keller, 2005; Kyem, 2004). This is evident in the various phases of upgrading where communities were able to overcome challenges because they had spatially based information at their disposal. By mapping their settings, communities were able to understand their settings better and confidently propose solutions to existing challenges.

Conversely, GI tools are seen as having the potential to marginalize other people and organizations (Harris, 1998). Although in practice GI tools can act to both empower and marginalize communities simultaneously, it is important to note that these processes are context-specific. In the case of Mukuru, the Chief was seen to support the process of upgrading while in Mahira, the Chief was initially opposed. In the former case, upgrading was confined to improving environmental health conditions. In the later, upgrading entailed securing tenure and improving the living conditions of the residents. Chiefs within the settlements have power to control most activities including allocation of land (COHRE,

2005). The support in Mukuru by the Chief may not have been the case if upgrading was to involve providing secure tenure to the residents. This would imply less control especially over land. The integration of GI tools will be viewed positively especially by those in power if it does not change their status.

### **9.3.3 Does technology make our lives better?**

GI tools are integrated in upgrading processes with a view to understanding the complex and dynamic settlement settings, which present challenges to planners. The tools are regarded as capable of enabling local authorities, communities and professionals to work in interactive ways to address the multi-faceted nature of informal settlements, through the diffusion of urban indicators that present unique opportunities to monitor living conditions in cities and in particular those of the urban poor (Martinez *et al.*, 2008; Abbott, 2003). GI tools are preferred in planning again because decisions relate to both development and the environment and are inherently grounded in the physical locations of key populations, resources, and issues, where spatial information is central.

Proponents of technological determinism assert that technology is a key governing force in society and determines social change. Technology changes the way people think and how they interact with others. Similarly technological advances are viewed as a central causal element in processes of social change. In this respect, change and social progress is driven by technological innovation, which in turn follows a predictable course (Croteau and Hoynes, 2003; Smith and Marx, 1994). However, critics of technological determinism argue that what counts more than technical features are social and political issues concerning the circumstances of production, modes of use, purposes, control and access, in other words the social or economic system in which it is embedded. Finnegan (1988) maintained that it is 'who uses it, who controls it, what it is used for, how it fits into the power structure, how widely it is distributed' that determines the impact of technology on society.

By using the Geo-Information made available to them, Korogocho residents were able to make proposals for new roads and infrastructure (Section 7.4). The planning committees were able to make their proposals with full recognition of their implications, such as structure removal for road widening. Modelling water supply and access within the settlement using geo-spatial tools showed areas lacking access to water. With this

information, planners could quantify and plan for new water points to ensure better minimum distances to supplies. Mapping and enumeration activities supported by the use of geo-spatial tools in Mahira enabled residents to generate models and maps showing settlement characteristics, which they later used for negotiating for secure tenure with the city council.

Issues of social transformation as a direct or indirect result of integrating GI tools are discussed in Chapter 7. In all the cases, residents observed changes in areas such as relationships and power structures and witnessed enhanced knowledge and improved livelihoods. Mapping revealed unknown opportunities in Mukuru which led to younger people starting projects such as solid waste collection and water supply. In Korogocho, the residents became engaged in road construction activities which started up as a result of mapping and the subsequent implementation of new infrastructure under the upgrading programme. Although the actual mapping activities did not employ many of the residents, the consequences of mapping led to the creation of numerous other opportunities which had a positive impact on community livelihoods, as highlighted in Chapter 7 (social transformation).

The argument presented above shows how technology helped to transform within the communities examined. Conversely, it may be argued that the prevailing social and political settings were important aspects governing the settlements and upgrading processes. Mapping or the use of geo-spatial tools would not have taken place if communities and development organisations were not convinced of their usefulness in the upgrading process. The mapping activities and data collection were determined by the stakeholders and were carried out on purpose to meet set objectives. The stakeholders in this case controlled and determined the nature of outputs, which in turn had a bearing on the planning process.

## **9.4 Implications for Planning Practice and Policy**

### *The process and participants*

Mapping and enumeration are capable of bringing change, and similarly triggering a chain of activities within informal settlements. Having communities participate in these activities allows for the identification of their needs as well as their vision. There is need for

processes to be inclusive and appreciative of the different needs of diverse groups based on gender and age within the settlements. Involvement of communities should not be used merely to rubber stamp proposals, but should feed into the design and decision-making processes as well. Processes should allow for decision integration rather than only decision support by communities. The lessons from Mukuru and Mahira attest to this conclusion, in that the communities' decisions proved important in directing the upgrading process to achieve objectives. As demonstrated in the chapter 5 and 6, the communities played instrumental roles in determining what data was to be collected and further contributed through verifying it. The verification of data may be interpreted as high-level participation by the community and supports community decisions to be integrated in the process. Organisations that support communities within informal settlements, especially in the acquisition of spatial data and tools for processing the data, may also be viewed as agents of change. Owing to community lack of resources and sometimes the technical skills for utilising GI tools, the role of external partners is considered essential. Goal-Kenya, the Pamoja Trust or even UN-Habitat, in the case of Korogocho, played important roles in helping to source spatial data and other mapping tools which were integrated within the upgrading processes. Partnerships between communities and other actors are likely to be beneficial if both of them understand and appreciate the others' potential. Indeed, external partners may provide the technical support, but communities understand their settings better and thus hold the key to successful upgrading. This is supported by Sliuzas (2004:180) who observes that without the support of communities, CBOs and other actors will cease to be effective agents in the development process.

The emergent community-led initiatives offer possibilities for improving living conditions within informal settlements. These initiatives offer sustainable approaches, as they are managed by communities themselves. Experiences from these cases show that it is imperative that planners take into account the social transformations that are likely to emerge from the physical upgrading processes. Providing an environment where communities can participate in upgrading processes from the onset ensures higher chances of attaining positive social change, as pointed out in Chapter 7.

#### *Addressing challenges*

The study has demonstrated how critical the communities are in analyzing their situations and how effective they are in contributing towards finding solutions to existing challenges. The community possesses an important asset, namely, local knowledge, upon which

development organisations rely for developing accurate models of the settlements and existing dynamics. This holds much promise for meeting the MDGs, given that accurate accounts of settlements are important if planners are to understand how much more is needed to ensure communities have access to basic services. The integration of GI tools with support from communities offers the possibility of accurately mapping settlement indicators, which may be used to plan and allocate resources corresponding to need. Planning policy and indeed settlement upgrading policy should support the use of GI tools and community inputs to achieve development objectives. Cap 286 of The Physical Planning Act in Kenya does provide for the participation of communities in planning initiatives. With this in mind, the settlement upgrading programme should promote participation by communities and integration of GI tools. Community driven mapping and enumeration processes are an ideal approach to use, and should not be viewed as aiming to usurp government or local authority powers but as supportive and alternative approaches to settlement upgrading. In essence, the role of government within upgrading processes should largely be that of providing an enabling environment that facilitates the smooth running of grassroots initiatives.

Developments regarding the potential of non state actors to produce spatial data are highlighted by Goodchild (2007) and Elwood (2008b). They argue that the public through volunteered geographic information (VGI) have become part of the latest 'popular revolutions' in the access and production of spatial information. Digital spatial data produced not by individuals and institutions formally charged as data producers, but rather, are created by citizens who use the tools described above to gather and disseminate their observations and geographic knowledge (Elwood, 2008b:173). VGI is premised on a bottom-up approach and therefore offers a suitable platform for informal settlement communities to actively participate for example in mapping their settings and sharing this information with other actors involved in upgrading. Elwood supports this notion by maintaining that; *by making it possible for more people to produce more data in digital form, VGI tools are likely dramatically increasing the volume of existing digital spatial data about an ever expanding range of topics* (ibid: 175).

The framework presented in Chapter 8 provides a way for city managers to benefit from community-driven initiatives. The approach also provides policy and decision makers with potential for gaining accurate data on settings. Lack of data has been decried as a key reason why city authorities are not able to address challenges within settlements (Hasan

*et al.*, 2005; Joshi *et al.*, 2002). Although planning policy in Kenya encourages the inclusion of a wide range of actors, barriers such as political interests and lack of planning knowledge need to be addressed before full participation benefits are realised.

## **9.5 Methodological Reflection**

A reflexive account of the research is presented, with a view to explaining factors which guided the research and how they influenced the outcomes presented. These factors include the researcher's previous experience and interaction with research subjects and the socio-economic environment where the research took place. By stating my position, it will be possible to understand the lens through which the research has been viewed. This account is based on personal and epistemological perspectives that both pre-existed the research and emerged in the course of it.

### **9.5.1 An epistemological account**

According to Willig (2001), epistemological reflexivity requires the researcher to ask questions such as how the research question defined and limited what was 'found' and how the design of the study and the method of analysis 'constructed' the data and the findings.

Questions and information to be collected were guided by the following issues: 1) how did the use of GI tools in settlement upgrading processes enhance the participation by actors, including settlement communities; and 2) how can GIS tools can be used to help communities and other actors improve the environment within the settlements?

The research acknowledges that other aspects of upgrading that were impacted by or related to the integration of Geo-Information might have been overlooked in the process. In this case, as a researcher, I determined what was to be explored.

Researchers may use a method or approach to collect data, assuming this will produce results. I used focus group discussions and key informant interviews to obtain much of the data used in this research. These tools may not have been able to garner information such as impacts at household level with regard to the integration of GI tools in upgrading.

An interpretivist approach was used to understand the impact of integrating GI tools (often associated with positivist approaches) in upgrading processes. This approach enabled me to explore the meanings that stakeholders including communities assigned to the role

played by GI tools in upgrading processes. In Chapter 6, the communities narrated their active participation in upgrading related activities such as mapping and enumeration. These activities as observed by the community enabled them to exercise control and voice their needs within upgrading processes. Thorough mapping, communities were able to understand their settings better. This provided them with the opportunity to address existing challenges as well as tapping into potentials brought to the fore.

The research used a qualitative approach as opposed to a quantitative approach to collect data. The former was used to collect in-depth detail concerning experiences within settlement upgrading processes where GI tools had been integrated. The exploratory nature of the research justifies the use of qualitative data and interpretation. In contrast, a quantitative method would have generated data to be analysed using statistical tools, which in essence would have produced different findings.

The research assumed the integration of GI tools in upgrading processes would have positive outcomes. Findings reveal negative aspects such as conflicts having taken place as a result of integrating GI tools in upgrading processes (section 6.7). The research also assumed a large number of persons had participated in the use of GI tools within the settlements. Indeed residents had participated in using GI tools but their numbers were limited, which meant that questionnaires to individuals would not be appropriate for collecting data from the community, as statistically significant thresholds could not be ascertained.

### **9.5.2 A personal reflexivity account**

The primary question arising here concerns what aspects of my personal and disciplinary background have led me to dwell on certain aspects of the research context and not others.

In Chapter 3 (Section 3.6), I recounted my previous work experience as an urban planner with the Government of Kenya, which had granted me opportunities to work within settlement upgrading projects. These assignments were in several urban areas, with those within Nairobi city were the most challenging owing to the size of settlements involved. Notable experiences included the development of a settlement information system for Kibera (by far the largest settlement in Nairobi) between 2001 and 2003. As a consultant, I had supported non-government organisations and communities in various



urban areas in East Africa in developing settlement information systems (Section 3.6). Over the years, I had developed contact with settlement leaders and residents, which in turn increased my desire to work towards finding lasting solutions to address the challenges facing informal settlements in Kenya.

My professional background and training in GI applications and urban planning partly explains why as a researcher I undertook to explore the use of these tools within upgrading approaches. There were several research options I could pursue, such as looking at the data quality and accuracy or mapping settlement spatio-temporal dynamics. However, the option of exploring the integration of technical tools in settlement upgrading had the potential to provide insight into a contemporary issue facing Nairobi as well as other cities within the region.

A deliberate attempt was made to examine upgrading processes in settlements where I did not have previous working experience or contact with the settlement communities. This was important given that the settlements had different experiences which would supplement previously acquired knowledge. In these new settings the people saw me as a stranger<sup>20</sup> necessitating that I negotiate my relationship at all times. This was evident in Korogocho, where I was required to seek clearance from the area Chief and Ministry of Local Government in order to gain access to the community. Although this was a good procedure to follow, it presented challenges in obtaining certain information from the concerned parties. Similarly, challenges were faced in the process of seeking data from Government sources. I was not able to obtain settlement-wide data on Korogocho from the Ministry of Local Government, owing to restrictions imposed by the officials. To develop a settlement database, I was forced to collect the same data, but from a limited area (Kisumu Ndogo village). The financial and time resources required to collect data on the entire settlement were not available to this research.

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<sup>20</sup> Outsiders in informal settlements are treated with some suspicion. Dealing with sensitive matters of planning and upgrading including land ownership, raised more suspicion. I had to make clear my role and interests in the settlements. My dressing and language gave away my identity as a stranger / non-resident.

## 9.6 Issues for further research

The subject of integrating GI tools in upgrading informal settlements is multifaceted and complex to handle through a single study. This study has covered issues regarding how the tools were integrated in upgrading processes, the participation of stakeholders, especially communities, and the potential of the tools to address existing environmental challenges within the settlements. There remain other important issues with regard to the integration of GI tools in upgrading processes. With that said, suggestions for further research are made, in order to indicate related and unexplored themes that could be examined.

*The process and integration of GI tools.* The study confined itself to examining upgrading processes where GI tools were integrated. A comparative analysis involving upgrading activities which did not integrate GI tools could provide a different perspective. This will provide a case for justifying integration of the tools or otherwise.

Upgrading is meant to address the physical and social needs of the communities in question, although mapping and enumeration activities introduced by 'outsiders' may not necessarily serve the interests of the community. Kwan (2002a) maintained that identity, power, and spatial knowledge were inseparably linked. The provider of spatial data may have other interests not obvious to the communities. Another approach to this case would be to explore situations in which communities undertook independent mapping and enumeration activities which would then be examined for consistency and accuracy. Research on how communities can implement mapping and enumeration activities is important, as this approach provides new sources of information regarding informal settlements. The emerging volunteered geographic information (VGI) platforms offer approaches which contrast situations where governments were considered as authoritative sources of information. Involving communities, especially those in low income urban settings, is a powerful approach which offers the opportunity for communities to collaborate and communicate their situational awareness. Making it possible for communities to produce spatial data on their environments opens avenues for increasing the volume of information regarding informal settlements on a wide range of issues (see Elwood, 2008b; Goodchild, 2007). Elwood (2008b) calls for further research on the issue since there is limited empirical investigation about how volunteered information might be stored, managed, searched, and shared between potential development actors and governments.

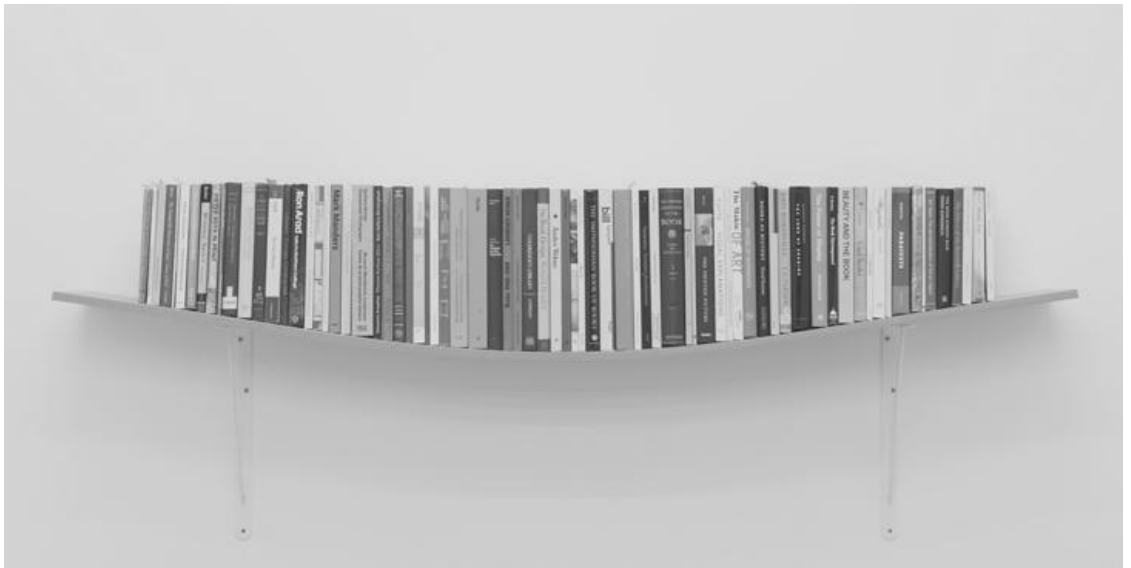
*Participation: actors, participation and roles.* Further research on the issue of local knowledge and its relevance to the upgrading process is required. The aspect of accuracy and who contributes this information is important. The perceptions of the different groups of people by gender and age with regard to the challenges facing the settlements may result in developing different spatial models representing the same issue. In theory collaborative planning recognizes and gives emphasis to the diversity of values, meanings, and interests within communities. The participatory mapping and enumeration activities constructed local knowledge in ways that were strongly influenced by existing social relationships within the settlements. The information for planning and outputs were shaped by relations of power and gender, as well as development partners and the researcher, which means that certain kinds of knowledge are often excluded. Further research is needed to explore the knowledge as well as power relations and external influences existed and as such could impact on participation in mapping and enumeration activities.

In all three cases, community representation in mapping was limited to a few individuals. This had a bearing on aspects such as the final selection of sites for implementing new interventions. In the case of mapping new roads in Korogocho, settlement committee members were tasked to generate a network of roads to be opened up in the settlement during the upgrading process. This may not have been the choice or preference of a majority of the settlement residents. Research should be conducted to compare planning recommendations and expressions by the wider community and compare these with those of settlement leadership, who may have different views despite residing in the settlement. The critical role of the community in upgrading processes and indeed mapping and enumeration activities cannot be overlooked. There is a need to explore models for inclusive participation in managing community or settlement wide databases as proposed in Chapter 8.

*Addressing challenges.* Besides providing information and visualisation of challenges facing settlements, the integration of GI tools has resulted in social transformations within settlements. Although this research has documented these transformations, further research on their sustainability and overall impact on communities is required. The scale of upgrading and subsequent integration of tools as demonstrated plays an important role in meeting community needs. There is need therefore to further explore social

transformation as a result of technology integration within small- and large-scale upgrading processes.

The positive role of information and communication technologies in the development process is clear. However, in developing contexts such as Kenya, the impact of GI tools is yet to be fully understood. The integration of these tools in upgrading processes serves as a catalyst to facilitate change and help stakeholders achieve upgrading goals. Importantly, it is the social context in which the processes take place that determines the impact and usefulness of these tools in the developing process. Further research to explore policy and planning frameworks suitable for supporting integration of GI tools would benefit both practitioners and communities alike. Reyes and Evan (2009) maintain that the most importance aspect is the ability to meet the daily realities and aspirations of communities within informal settlements.



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## ***Publications, Papers and Conferences Attended by the Author***

### ***Papers***

Mbathi, M. Governance and the Web" Paper submitted to Journal of Location Based Services, Paper submitted in December 2010, Special issue on Participatory Governance. In review

Technology and Governance: Chapter in International Perspectives in Urban Planning Research; edited by Kellett, P and Hernandez, J (forthcoming)

### ***Conferences and Papers Presented***

Musyimi Mbathi (2010)"Governance and the Web" Paper presented at Royal Geographical Society-Institute of British Geographers (RGS-IBG) Annual Conference; 1st – 3rd September 2010, London, University College of London

Musyimi Mbathi (2010) Technology and Governance-Enhancing Participation Using Geographical Information Tools (GIS) In Low Income Settlements) Paper presented at the CIB World Congress Salford, Manchester UK 11th -13th May 2010

Mbathi, M (2009) Enhancing Participation Using Geographical Information Tools In Low Income Settlements; Paper presented at International Development Planning Review (IDPR) Centenary Conference Liverpool 6th – 7th April 2009

Mbathi, M (2009) "Equality, inclusion and social cohesion; The promise of Geo-Information tools. A case for settlement upgrading in Kenya" Paper presented at UK-Ireland Planning Research Conference Newcastle 1st -3rd April 2009

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## **Appendix A: Lead questions for focus group discussions**

### **GIS tools used:**

*What GIS tools were used during the upgrading process? (GPS, satellite images, Aerial photos)*

### **Information collected:**

*What information is collected and by who? (Spatial and attribute data)*

### **Participation:**

*Who were the main participants in the slum mapping with regards to gender and youth?  
What roles did the following play in mapping / upgrading?*

- 1. Communities and*
- 2. Settlement leaders*
- 3. Government officials*

### **Addressing environmental problems:**

*How did use of tools enable community and other actors identify problems within settlements?*

*How were GIS tools and outputs used to solve existing environmental problems?*

### **Decision making:**

*How are / were outputs from the GIS mapping useful for decision making?*

*How does the mapping process enhance transparency / governance within settlements?*

### **Process:**

*What were the main stages or steps in the mapping process (from start to end)?*

*What role did community and other actors play in the entire process?*

### **Impact:**

*What outcomes / outputs are as a result of using GIS tools in the upgrading process?*

*What would be different if the tools were not used in slum upgrading?*

*What are the advantages of settlement mapping?*

### **Improvement:**

*What challenges are posed in using GIS tools for slum upgrading?*

*How can GIS tools in settlement upgrading be applied to enable communities use and apply them?*

## **Appendix B: Lead questions for key informants in upgrading programmes**

### **GIS tools used:**

*What GIS tools have you used in your projects / programmes?*

### **Information collected:**

*What information (spatial and attribute data) was collected and by who?*

### **Use and application of the tools:**

*What reasons were given for using the tools in the programme / project?*

### **Participation:**

*Who were the main participants in settlement mapping with regards to gender and youth?*

*What role did communities and leaders play in upgrading and mapping exercises?*

*What was the role of government appointed leaders in the process?*

*How does the mapping process enhance transparency / governance within settlements?*

### **Problem identification:**

*How did use of tools enable community and other actors identify problems within settlements?*

### **Addressing environmental problems:**

*How were GIS tools and outputs used to solve existing environmental problems?*

*How important was the data collected in addressing community / settlement problems?*

### **Decision making:**

*How are / were outputs from the GIS mapping useful for decision making?*

### **Process:**

*What were the main stages or steps in the mapping process (from start to end)?*

*How did use of the tools help in settlement planning process?*

*What role did community and other actors play in the entire process?*

### **Impact:**

*What outcomes / outputs were attributed to use of GIS tools in the upgrading process?*

*How do outputs & process enhance knowledge of communities regarding their settings?*

*What would be different if the tools were not used in settlement upgrading?*

*What are the advantages of settlement mapping?*

### **Improvement:**

*What challenges were experienced in using GIS tools for settlement upgrading?*

*How can GIS tools in settlement upgrading be applied to enable communities use and apply them?*



## **Appendix C: Lead questions for key informants from development agencies**

### **GIS tools used:**

*What GIS related tools are mainly used in settlement upgrading programmes?*

### **Information collected:**

*What are the key information requirements in settlement upgrading programmes?*

### **Use and application of the tools:**

*What reasons are given for using the tools in the settlement upgrading programmes / projects?*

### **Participation:**

*Who are the main participants in the settlement mapping?*

*What role do communities and leaders play in settlement upgrading and mapping exercises?*

*In what ways does the mapping process enhance transparency / governance within settlements?*

### **Problem identification:**

*How effective are GIS tools in enabling community and other actors identify problems within settlements?*

### **Addressing environmental problems:**

*How can GIS tools and outputs be used to solve existing environmental problems?*

### **Access to data:**

*What issues determine access data by communities?*

### **Decision making:**

*How can outputs from the GIS mapping be used for decision making?*

### **Process:**

*What were the main stages or steps in the mapping process (from start to end)?*

*What role did the key actors play in the entire process?*

### **Impact:**

*What would be different if the tools were not used in settlement upgrading?*

*What are the advantages of settlement mapping?*

### **Improvement:**

*What challenges are posed in using GIS tools for settlement upgrading?*

*How can GIS tools in settlement upgrading be applied to enable communities use and apply them?*

## Appendix D: Checklist for community led mapping in Korogocho

<b>Korogocho Informal Settlement Upgrading</b>			
Structure Number	_____	Name of Enumerator	_____
<b>Landlord:</b>	Male <input type="checkbox"/>	Female	<input type="checkbox"/>
<b>Landlord</b>	Absent <input type="checkbox"/>	Reside Within	<input type="checkbox"/>
<b><u>Structure Building Material</u></b>			
Stone	<input type="checkbox"/>	Mud and wattle	<input type="checkbox"/>
GCI	<input type="checkbox"/>	Timber	<input type="checkbox"/>
<b><u>Infrastructure</u></b>			
Water	YES / NO	Electricity	YES / NO
Toilet	YES / NO		
Number of Rooms	<input type="checkbox"/>		

## Appendix E: List and schedule of meetings and interviews

Activity	Date	Details
Focus group discussion	5 <sup>th</sup> February 2010	University of Nairobi (slum mapping team)
	19 <sup>th</sup> February 2010	Korogocho (with Goal Kenya)
	22 <sup>nd</sup> February 2010	Mukuru (with Goal Kenya)
	26 <sup>th</sup> February 2010	Mahira (with Pamoja Trust)
	09 <sup>th</sup> March 2010	Korogocho (with Korogocho slum upgrading programme officials)
Key informant interviews	24 <sup>th</sup> August 2009	David Mathenge Pamoja Trust – Programme officer –Pamoja Trust)
	24 <sup>th</sup> August 2009	Cleophas Onono Project officer – Goal Kenya
	27 <sup>th</sup> August 2009	Dr Jan Turkstra (UN-HABITAT)
	19 <sup>th</sup> February 2010	John Okello (Secretary Korogocho Residents Association)
	19 <sup>th</sup> February 2010	Peter Kinyanjui (chairman Korogocho Residents Association)
	10 <sup>th</sup> March 2010	Herbert Musoga (Physical planning department - Ministry of Lands)
	12 <sup>th</sup> March 2010	Cleophas Onono (Project officer Goal Kenya)
	15 <sup>th</sup> March 2010	David Mathenge (Pamoja Trust)
	17 <sup>th</sup> March 2010	Roi Chiti (UN-HABITAT)
	9 <sup>th</sup> July 2010	Dr Jan Turkstra (UN-HABITAT)
	12 <sup>th</sup> July 2010	Jackson Kago (Kenya-Italy Debt for Development Programme -KIDDP)
	15 <sup>th</sup> July 2010	Dr Claudio Acioly (UN-HABITAT)
	17 <sup>th</sup> July 2010	Kenneth Nyaseda (Programme Manager, KSUP, MOLG)
		20 <sup>th</sup> July 2010
Round table meeting on Korogocho slum upgrading programme	17 <sup>th</sup> March 2010	Nairobi

## Appendix F: A translated focus group discussion

Name of focus group discussion: **Mukuru Settlement**

Date of meeting: **26th February 2010**

Place: **Mukuru Chief's Camp**

Participants: Kioi Ngatia (Mariguini village), Samuel Onyango (Hazina village), Jeanette Waite (Hazina village), Esther Gitau (Kayaba A&B village), Grace Hellen (Kayaba), Jacinta Mwangi (Hazina village), Onono Cleophas (Goal-Kenya), Esther Muthoni (University of Nairobi), Micheal Mburu (Kayaba)

Themes / Issues	Conversations / Feedback
<b>GIS tools used:</b>	<p><b>Facilitator:</b> What tools were used during the upgrading process?</p> <p><b>Participants:</b> The tools we used were Google map, questionnaire / checklist and camera</p>
<b>Information collected:</b>	<p><b>Facilitator:</b> What information is collected and by who? (Spatial and attribute data)?</p> <p><b>Participants:</b> House survey, number of toilets, bathrooms, water points. Location of solid waste dump sites and drainage channels</p>
<b>Participation:</b>	<p><b>Facilitator:</b> Who were the main participants in the slum mapping?</p> <p><b>Participants:</b> Community representatives who included settlement elders, community health workers and youth leaders were invited by Goal-Kenya who told them of the project. This meeting was held at St. Veronica Church</p> <p><b>Facilitator:</b> How were the people selected to participate in the mapping?</p> <p><b>Participants:</b> Some leaders did not know what mapping was therefore needed further training. Some people in the community did not know while others had some idea. The team to be involved was well versed and had some training in community development issues.</p> <p>The team was composed of peer educators, community health workers, community elders and representatives from organisations such as MABWOK (make a better world Kenya)</p> <p><b>Facilitator:</b> Who were the main participants in the slum mapping with regards to gender and youth?</p> <p><b>Participants:</b> Composition: Mariguini (4 M, 7 F), Kayaba A &amp; B (3F), Kisii (1M, 2F), Kayaba C&amp;D (3F), Kayaba E (1M, 2F)</p> <p><b>Facilitator:</b> What roles did the following play in mapping / upgrading?</p> <ol style="list-style-type: none"> <li>1. Communities and</li> <li>2. Settlement leaders</li> <li>3. Government officials</li> </ol> <p><b>Participants:</b> Community:- they gave information, were very co-operative because they were eager to participate in information giving and offer moral support, provide security to mapping teams</p> <p>Community elders:- These are like gate keepers. One cannot enter settlement without their consent. Offered support after they were understood the importance of project. Helped in identification of village boundaries in consultation with community health workers.</p> <p>Community believed in the project once they saw the elders therefore their presence was essential to mapping. They also helped to identify sites for new facilities like toilet blocks.</p> <p>Chief:- Gave consent therefore permission to undertake exercise. Offered security and kept records of project activities</p>
<b>Addressing environmental problems:</b>	<p><b>Facilitator:</b> How did use of tools enable community and other actors identify problems within settlements?</p> <p><b>Participants:</b> They helped us to understand health aspects. By just looking with our eyes we cannot know what problems exist. Maps helped us in a great way.</p> <p><b>Facilitator:</b> How were GIS tools and outputs used to solve existing environmental problems?</p> <p><b>Participants:</b> Outputs used to sensitize people on shortage of toilets therefore new economic ventures identified.</p>

	Toilets removed by NEMA since they were near the river.
<b>Decision making:</b>	<p><b>Facilitator:</b> How are / were outputs from the GIS mapping useful for decision making?</p> <p><b>Participants:</b> After mapping, new groups came up to address situation eg solid waste whereby groups were formed to start collection in the villages. In Mariguini the group started with 20 households but has now over 300 households have joined the scheme. Fuata Nyayo has over 300 households already joined the solid waste collection. Youth groups have benefitted more</p> <p>New bio-centres were developed as a result of mapping.</p> <p>Our knowledge has increased after the mapping exercise</p> <p>Environment Youth Against Crime Group in Fuata Nyayo settlement have used maps to identify sites for waste collection and recycling.</p> <p>Water pipes types were identified eg plastic pipes which are prone to leaks. New pipes to be fitted were to be those of galvanised iron type.</p> <p>New waste chambers and tanks were constructed as a result. Drains are now cleaner and river is less polluted after mapping exercise.</p> <p><b>Facilitator:</b> How does the mapping process enhance transparency / governance within settlements?</p> <p><b>Participants:</b> After mapping all toilets near river were removed but this has resulted to more flying toilets. Using maps we can know which areas are experiencing flying toilet problems. We can identify where problem and needs are highest therefore need for intervention.</p>
<b>Process:</b>	<p><b>Facilitator:</b> What were the main stages or steps in the mapping process (from start to end) and what role did community and other actors play in the entire process?</p> <p><b>Participants:</b></p> <ol style="list-style-type: none"> <li>1. Letter of intent sent to Chief of Mukuru by Goal-Kenya</li> <li>2. Mobilisation of community (community health workers, peer educators, elders and CBOs from Mukuru).</li> <li>3. Training workshop organised by Goal-Kenya to train enumerators on the use of maps + questionnaire development. Pre-testing of questionnaires and map reading was carried out during this phase.</li> <li>4. Data collection and analysis. Verification of data was done on a daily basis. Analysis was done by Goal-Kenya and not community</li> <li>5. Feedback session organised by Goal-Kenya and Umande Trust at Full Gospel Church. Report taken back to community for verification and correction.</li> <li>6. Community Action Plan where plan was presented to larger audience of public and other stakeholders from government and NGOs.</li> <li>7. Implementation. Identification of community groups to be involved in construction. Follow-up meetings to inform community on what CBOs could do.</li> </ol>
<b>Impact:</b>	<p><b>Facilitator:</b> What outcomes / outputs are as a result of using GIS tools in the upgrading process?</p> <p><b>Participants:</b></p> <p>A meeting was held at South B to disseminate the findings. This was the Community Action Planning session where we were shown the mapping report and the outputs linked to relevant stakeholders for further action.</p> <p>Before the meeting, 10 representatives from each village were called upon to verify and further update the information.</p> <p>Prioritizing was done with reference to the report outputs. For example in Mariguini, solid waste was 1<sup>st</sup>, sanitation 2<sup>nd</sup> and water was 3<sup>rd</sup>.</p> <p>Based on the outcomes, the bio-centres in Fuata Nyayo and Kayaba were constructed. NB: In Futa Nyayo and Kayaba, sanitation was priority No.1.</p> <p>Upon presentation, NEMA became more involved in Mukuru and started to address existing problems such as river pollution.</p> <p>In Mariguini a cooperative was started to manage solid waste. The youth group Nairobi South Youth Group "NSYG" was established. Solid waste was No.1 priority in Mariguini</p> <p>Toilet in Fuata Nyayo was supported by CDF who put in money to buy a plot for Hope and Joy Group.</p> <p><b>Facilitator:</b> What are the advantages of slum mapping?</p>

	<p><b>Participants:</b> Mapping involved people from the respective settlement /village where they were known and had good information.</p> <p>Community decision on priorities was based on the outcomes of the project. Other actors started acting based on the outcomes eg water tanks have since been established as a result of the mapping. Other advantages of mapping are; proper planning, prioritising basic needs, awareness creation, equip community with materials to plan and knowledge, creation of employment (water vendors), youth transformation (those who were thieves are now involved in solid waste collection).</p> <p><b>Facilitator:</b> What would be different if the tools were not used in slum upgrading?</p> <p><b>Participants:</b> Things would be different without mapping. Goal-Kenya would not have identified problems affecting the community.</p> <p>There would be wrong / different prioritising of projects.</p> <p>Mapping increases people's ideas. Without it we would not be where we are today. Without mapping our level of awareness would be low.</p> <p>Survey led to Nairobi water company acting on report. For example they unblocked sewers.</p>
<b>Improvement:</b>	<p><b>Facilitator:</b> What challenges are posed and how can we improve slum mapping?</p> <p><b>Participants:</b> Involve all stakeholders, have consultations and meetings. NGOs need to deliver on promises.</p> <p>Support the mapping teams and recognise their efforts. Initially we started with many people but some pulled out owing to low remuneration.</p> <p>There is need for careful selection of participants.</p> <p>Researchers and NGOs should actualise their plans. Expectations are still high therefore there is need to meet these.</p> <p>Select able people and consider gender and age. We need to see youth, elders, men and women so that there are no suspicions from the community we are serving.</p> <p>Approach of the mapping teams needs to be improved. The teams need to have a people approach. There needs to be harmonisation of language and communication within teams.</p> <p>A comparison study should be done after 2 years to show impact of mapping and interventions.</p> <p>The structures are temporary and life is very dynamic therefore mapping should be periodic t reflect on what is on the ground. It is important to note that people do not live permanently in the settlement therefore the issue of giving maps which they can update themselves may not be viable.</p>



## Appendix H: Memorandum of Understanding for upgrading Mahira

MEMORANDUM OF UNDERSTANDING

ON

THE UPGRADING OF THE SLUMS IN HURUMA

### Parties to the MoU

- Nairobi City Council
- Residents of the following settlements in Huruma:
  - A. Kambi Moto
  - B. Mahira
  - C. Redeemed
  - D. Ghetto
  - E. Gitathuru
- Pamoja Trust
- Intermediary Technology Development Group
- COOPI
- Shelter Forum

### Preamble

Taking note that in the last three years, the Nairobi City Council, Pamoja Trust, Intermediary Technology Development Group (hereinafter referred to as ITDG) and a number of other institutions have been working closely with the residents of the five Huruma informal settlements towards the improvement of their living conditions.

And further taking note that to date five of the informal settlements of Huruma have been designated as special planning areas by a Council Resolution and are at an advanced stage of urban planning. The process is geared towards the regularisation of the settlements and the opening up of opportunities for the residents of the five villages to construct adequate housing, obtain secure tenure and adequate services.

And appreciating that the Nairobi City Council, a local authority created under the Local Government Act, the residents of Huruma (hereinafter referred to as the residents or the beneficiaries), the Pamoja Trust a non profit organisation registered under the Trustees Perpetual Succession Act, The Shelter Forum, a local nongovernmental organisation, ITDG and COOPI both of which are international nonprofit organisations, in furtherance of their commitment to improve the living conditions of the urban poor within Nairobi have embarked on an upgrading programme in Huruma (hereinafter referred to as "the programme")

Now therefore The Nairobi City Council, the beneficiaries, Pamoja Trust, COOPI, ITDG, and Shelter Forum (hereinafter collectively referred to as the Parties) have entered into this Memorandum of Understanding in furtherance of their common goal (hereinafter referred to as the MOU)



## Beneficiaries of the Programme

The beneficiaries of this programme shall be all the residents, both tenants and structure owners, currently resident in all the informal settlements of Huruma, which are situated within the Starehe constituency in Nairobi.

## The Programme Area

The programme area shall comprise of all that land currently occupied by the residents of the informal settlements of Huruma and any relocation, or spill over sites that may be identified and agreed upon by the parties.

## Objectives of the Programme

The programme will have the following broad objectives

- To improve the lives and living conditions of the residents of the informal settlements of Huruma through:
  - The provision of secure tenure
  - The provision of sufficient infrastructure and services, these will include roads, drainage, water, sewerage and sanitation.
  - Increasing access to affordable and improved housing.
- To enhance the resident's capacity to participate in the upgrading process and to thereafter manage and maintain any improvements made.
- To improve the livelihoods of the residents through the development of skills and the promotion of income generating activities. This will amongst other things enable the beneficiary's address the social and economic issues that affect their lives such as insecurity, and HIV AIDS and its effects.
- To serve as a pilot project which can be replicated in other settlements by ensuring learning through the continuous, monitoring, evaluation and documentation of the programme.
- To ensure g  
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## Execution of the Programme

- The parties agree that they will monitor compliance with any and all prior obligations, as may be set out in the programme documents, as being necessary conditions for the commencement of the programme
- The parties shall, once in every six months, prepare bi annual action plans to guide their operations. The plans shall clearly indicate the results expected to be achieved within the plan period, the activities to be undertaken, the time within which the said activities shall be accomplished, and the parties responsible for the execution of the planned activities
- The parties shall hold monthly meetings to evaluate and monitor the progress made in the programme. The meetings shall be comprised of representatives from the relevant departments of the City Council, the other parties to this memorandum and any other person or institution that the parties may deem necessary.
- In the performance of their duties, Advisory Experts, Consultants and Volunteers assigned by the stakeholders to execute any part of the programme shall act in close consultation with the persons or bodies designated by the Parties.
- Technical and other equipment, materials, supplies and other property financed or provided by any of the stakeholders shall belong to the purchasing agent/ stakeholder.

## Settlement of Disputes

- The parties shall use their best efforts to settle amicably any dispute, controversy or claim arising out of this MOU or the programme document or the breach termination or invalidity thereof.
- Any dispute, controversy or claim between the parties arising out of this MOU, including the programme documents, which is not settled amicably in accordance with paragraph one above, shall be referred at the request of any of the parties to this memorandum for arbitration to a committee to be appointed by the parties in conflict. Each of the said parties shall appoint one arbitrator and the arbitrators appointed shall appoint a third, who shall be the chairperson.