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juma_egerton@yahoo.com

Noragric
Department of International Environment and Development Studies
P.O. Box 5003
N-1432 Ås
Norway
Tel.: +47 64 96 52 00
Fax: +47 64 96 52 01
Internet: <http://www.umb.no/noragric>

STUDENT'S DECLARATION

I, Juma Knowlden Ochieng, declare that this thesis is a result of my own research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signed: _____

Juma Knowlden Ochieng' (981059)

Date: _____

ABSTRACT

Climate change and variability impacts are global concerns but in Kenya, this is becoming critical as an increasing large part of both rural and urban population is becoming vulnerable to diverse natural hazards. This main objective of this study was to investigate the role of local institutions in facilitating climate change adaptation in urban informal settlements with Mathare 4B as the case study. The study therefore first investigated the relevant local institutions and their actions in relation to adaptation to climate change, and then proceeded to examine how they are accessed and by whom. It then looks at how extra-local institutions have interacted with the local institutions in facilitating climate change adaptation. Using Participatory Urban Appraisal (PUA) methodology, qualitative data was collected from primary and secondary sources during two field trips and then analysed using issue-centred methodology. Findings from the study reveal that local institutions are very much involved in the facilitation of climate change adaptation in Mathare 4B through mediating social support systems, financial empowerment, access and use of weather information, disaster management and connections with extra-local institutions. The study further reveals that households and social groups have varying access to local institutions largely dependent on socio-economic positions, tribe, gender and age. The study finds that several extra-local institutions are actively involved in facilitating climate change adaptation in Mathare 4B and closely interact and collaborate with the local institutions. Overall, the study concludes that local institutions are very important in facilitating climate change adaptation in urban informal settlements and that government and external partners should put more efforts in collaborating and interacting with them.

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TABLE OF CONTENTS

STUDENT'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	vi
LIST OF ABBREVIATIONS	ix
TABLES, FIGURES, PHOTOS AND MAPS	x
CHAPTER 1	1
1.0 INTRODUCTION	1
1.1 Background of the Study	1
1.2 Research Objective and Thesis Statement	3
1.3 Thesis Outline	6
CHAPTER 2	8
2.0 CONCEPTUAL AND THEORETICAL PERSPECTIVES	8
2.1 Climate Change and its Impacts	8
2.2 Vulnerability	10
2.2.1 Social Vulnerability	11
2.2.2 Vulnerability and Poverty	11
2.3 Climate Change Adaptation	12
2.4 Role of Local Institutions in Climate Change Adaptation	13
2.4.1 Conceptual Framework	13
2.4.2 Classification of Local Institutions	14
2.4.3 How local institutions affect Adaptation and Livelihoods	14
2.4.4 Linkages among Institutions: Access and Articulation	15
2.5 Social Network Analysis	17
2.6 Chapter Summary	18
CHAPTER 3	20
3.0 RESEARCH METHODOLOGY	20
3.1 Introduction	20
3.2 Research Methodology	20

3.3	Ontological and Epistemological Considerations	21
3.4	Research Design.....	22
3.4.1	Population	23
3.4.2	Sampling Design.....	23
3.5	Data Collection Methods	23
3.5.1	Observation.....	24
3.5.2	Interviews.....	25
3.5.3	Literature Review.....	28
3.6	Data Analysis Methods	28
3.7	Data Quality Considerations	29
3.7.1	Reflexivity.....	29
3.7.2	Trustworthiness.....	30
3.8	Ethical Considerations	33
3.9	Chapter Summary	35
CHAPTER 4	.....	36
4.0	THE STUDY AREA.....	36
4.1	Kenya and Climate Change	36
4.2	Nairobi	38
4.3	Mathare Informal Settlement	39
4.4	Community Perceptions of Weather Conditions	41
4.5	Vulnerability to Severe Weather.....	42
4.6	Adaptation to Weather-related Hazards.....	44
CHAPTER 5	.....	48
5.0	FINDINGS AND DISUCSSIONS	48
5.1	Role of Local Institutions in the Adaptation to Climate Change.....	48
5.1.1	Food Production Strategies	50
5.1.2	Environmental and Waste Management Issues	52
5.1.3	Systems of Social Support/Social Capital.....	53
5.1.4	Disaster Risk Reduction/Emergency Response	53
5.1.5	Economic Empowerment.....	54
5.1.6	Facilitating Weather and Climate Information	55

5.2	Interaction of Extra-Local Institutions with Local Institutions.....	56
5.2.1	Financial Support	57
5.2.2	Emergency Interventions	58
5.2.2	Livelihood Diversification	58
5.3	Degree and Type of Access to Local Institutions	59
CHAPTER 6	.....	62
6.0	CONCLUSIONS.....	62
REFERENCES	.....	64
APPENDICES	.....	70
APPENDIX I: Definition of Terms	.....	70

LIST OF ABBREVIATIONS

CCA	Climate Change Adaptation
CCM	Climate Change Mitigation
DRR	Disaster Risk Reduction
IPCC	Intergovernmental Panel on Climate Change
PUA	Participatory Urban Appraisal
SSA	Sub-Saharan Africa
UNFCC	United Nations Framework Convention on Climate Change
UN/ISDR	United Nations International Strategy for Disaster Risk Reduction

TABLES, FIGURES, PHOTOS AND MAPS

No.	Description	Page
TABLES		
5.1	List of institutions facilitating CCA	49
5.2	Focus areas of local CCA institutions	56
FIGURES		
2.1	Adaptations, Institutions and Livelihoods (AIL) Framework	13
4.1	Nairobi's temperature trends	37
PHOTOS		
4.1	Shanties built on edge of quarry	40
4.2	Shanties built on bottom of quarry pits	41
4.3	Aftermath of flooding in Mathare 4B	43
4.4	Napier grass grown on bank of river Mathare	46
4.6	Shanties built on stone foundation	46
5.1	Urban agriculture farm	51
5.2	Greenhouse in Mathare 4B	51
MAPS		
4.1	Map of Kenya	37
4.2	Nairobi metropolitan area	38
4.3	Mathare informal settlement	40

CHAPTER 1

1.0 INTRODUCTION

1.1 Background of the Study

Climate change resulting from increases in greenhouse gases are expected to result in increase in temperatures and shifting rainfall patterns, significantly affecting human livelihoods (IPCC, 2007). In its Human Development Report 2007/2008, UNDP (2008) emphasizes the important connections between climate change and poverty and its implications on livelihoods. Climate change is a global phenomenon that will affect all countries in some way (IPCC, 2007).

The Intergovernmental Panel on Climate Change (IPCC) predicts that sub-Saharan Africa (SSA) is and will be worst affected by climate changes despite being the least contributor to global warming. Its climate is warming faster than anywhere else in the world and it is also the poorest region socio-economically (IPCC, 2007). The continent's exposure to changes in climate is very high with up to 40 per cent of the total population residing in arid and semi-arid areas and 25 per cent of the population living in coastal areas, places predicted to be most vulnerable to climatic changes (IPCC, 2007).

There still exists some uncertainty on how climate change is related to and influence extreme events but according to O'Brien et al. (2008), there is need for increased knowledge on the relations, in order to facilitate action that reduces vulnerability. Frequencies, intensities and impacts of disasters have increased dramatically over the recent decades, affecting the poorest in least developed countries the most (IPCC, 2007). These disasters are a consequence of the subjection of vulnerable households, communities and ecosystems, to shocks or stresses that they are not able to withstand or recover from without the assistance of external agents (Ireland, 2010).

There is little attention given to urban climate change adaptation strategies with most strategies having a rural focus (Birkmann et al 2010). According to the International Commission on Climate Change and Development, '*Cities and city dwellers have received too little attention in discussions of climate change impacts and adaptation*' (Commission on Climate Change and Development, 2009 p. 98). It adds that the impacts of climate change are still thought of as affecting mostly rural areas with agriculture and livestock affected as a result of floods and droughts.

There are however, advances being made towards understanding urban climate change adaptation but the evidence base is still scarce (Parnell & Walawege 2011). Empirical evidence exists for OECD countries and a few other urban areas in the south including Durban and Rio de Janeiro. Studies in climate related changes in African urban areas are insufficient and erratic thus providing an academic opportunity to study the underlying drivers of urban climate related vulnerability in order to formulate and implement suitable climate change adaptation (CCA) strategies. Ironically, we know least about the dynamics and challenges facing urban Africa, despite the projections of the IPCC's Fourth Assessment Report (IPCC 2007) that Africa, which contributed only 5-6% of global greenhouse gas emissions, will experience among the most severe, widespread and sustained impacts of climate change.

Climate change has become important in redefining development and the prospects for growth of communities and households will be determined by how they respond to the impacts of climate change. Agrawal (2008) notes that going by possible scale of imminent changes in institutional and social relationships, there remains a large gap in knowledge about the role of local institutions in adaptation to climate change. A study on the role of local institutions in adaptation to climate change in informal settlements may be well addressed through ethnographic research in relation to climate adaptation.

For the purpose of this study, local institutions refer to formal and informal organizations, social groups and individuals mainly with accountability and legitimacy established within the communities in which they operate in. These are classified into three broad

categories including public (bureaucratic administrative units, and elected local governments), civic (individuals, households, membership and cooperative organizations) and market (service and business organizations) (Agrawal, 2008).

1.2 Research Objective and Thesis Statement

The link between climate change and disasters is not always clear, but increased frequency and/or intensity of extreme weather events such as increased precipitation and heat waves have been identified as the main manifestations and likely impacts of climate change in SSA, and have been identified as the major causes of disasters (IPCC, 2007). Moser et al., (2010) note that environmental refugees affected by climate related stressors are already swelling the tide of rural-urban migration in many parts of SSA. According to the IPCC (2007), urban centers in SSA are affected by climatic changes including increasing the risk of flooding, landslides, droughts, heatwaves and strains on food produced locally.

In Kenya, the pace of urbanization has been increasing rapidly with the UN Habitat (2008) estimating a growth rate of 1.2 per cent per year for the period 2005-2010 and projected to account for about 32 per cent of the total population by the year 2012. This report also estimated a population growth of 3.8% in Nairobi with more than 60% of the population living in informal settlements that make up only 5% of the geographical area. Analysis of the urbanization trends in Nairobi indicates that informal settlements are a definitive character of the city (UN Habitat, 2008). According to UN Habitat (2008), Nairobi has been experiencing more intense and frequent weather related events in the recent past which include cases of severe floods, heatwaves, as well as landslides. These events have had serious effects on the population living in informal settlements

The point of departure for this thesis is that natural hazards are socially constructed and are therefore strongly affected by vulnerability and adaptation. While natural hazards are often causes, the change into risk and potential for disaster is contingent upon human exposure and lack of capacity to cope with negative impacts (Douglas et al. 2008). Types

of risks and shocks from weather related events are as a result of inequitable power relations between different social classes and residential parts of cities (Pelling, 2003).

Several studies including by Moser et al. (2010) in Kenya and Nicaragua, Lwasa et al. (2009) for Kampala, Glehouenou-Dossou (2007) for Cotonou and Awuor et al. for Mombasa do in fact point out the risks caused by extreme weather events, highlighting differences in the nature and scales of these risks between urban centres and also on how they affect different locations and population groups within the urban centres. Within these African cities, most of the risks fall on the poorest of the population who often live in high risk areas and with inadequate provision of protective services (Moser et al., 2010). The risks that extreme weather events present, may lead to calamities and catastrophes. For poor people with high vulnerability and low adaptive capacity and resilience, such events can be particularly destructive (Ireland, 2010).

Individuals, government institutions, civil society organisations and businesses operating at the local level most directly experience on-the-ground effects of climate change. Adaptation to the impacts of climate change demands changes in response to multiple stresses, across multiple scales and by many institutions (Crane, 2013). Indeed the role of local institutions such as local government units, both formal and informal local organizations such as cooperatives, women/youth groups, and NGO's is broadly accepted in a lot of studies of climate change adaptation (Young and Lipton, 2006). Two studies, one by Adger (2000) and the other by Agrawal (2008) have indeed highlighted the importance of local institutions in facilitating adaptation to climate change at local level by among other things managing and implementing locally driven adaptation initiatives, creating opportunities for collective learning and by mediating interventions suitable to the local context.

Though the characteristics of these local institutions are well known, very little of existing studies have carefully analyzed the different types of local urban institutions relevant to climate hazards-related adaptation, their roles in adaptation context or their interactions with extra-local institutions (Huq and Reid, 2007). This study seeks to fill

this gap by investigating the role of local institutions in adaptation to climate change in Mathare 4B informal settlement of Nairobi. Residents of this village are vulnerable to multiple climate related stressors and live in risk-filled environment prone to hazards such as floods and landslides.

Poor households in Nairobi are experiencing the negative impacts of climate change resulting in changes in weather patterns including prolonged droughts, intense precipitation and heatwaves (UN Habitat, 2008). This variability in weather patterns have caused substantial damages to property and well-being for residents in these informal settlements resulting in localized flooding, damage to property and health risks (UN Habitat, 2008). However, it has been noted that unless serious weather events lead to catastrophic disasters in the informal settlements, they are seldom addressed by extra-local institutions.

Prior to relocating to Norway and pursuing a master's study at NMBU, the researcher had lived and worked in Nairobi. He worked for the Kenya Red Cross and as part of his portfolio were disaster management and risk reduction programs in Nairobi. Through this, the researcher became acquainted with the vulnerability to and frequency in the occurrence of weather-related hazards especially floods and landslides in Nairobi's informal settlements that often led to deaths and left many households destitute. He also realized that within these "*vulnerable*" communities, there were many local institutions involved in actions that facilitated the prevention, reduction and adaptation to the weather-related hazards, who however did not receive much attention. It is against this background that the objective of this study was to investigate the role of local institutions in facilitating climate change adaptation in urban informal settlements. The study addresses the above objective through focusing to answer the following three research questions:

1. What role do local institutions have in the adaptation to climate change in Mathare 4B?

2. What is the degree and type of access that households and social groups have to local institutions?
3. How do extra-local institutions interact with local institutions in facilitating climate change adaptation?

1.3 Thesis Outline

This thesis is structured into six chapters. Chapter one presented an introduction of the issue under study including presenting the study objective and research questions. Chapter two presents a review of literature associated with urban climate change adaptation and the role of local institutions in particular. The theoretical and conceptual framework that was used for analysis of findings is discussed too. Chapter three presents the research methodology, discussing the research design, data collection and analysis methods and ethical considerations that guided the research. The study's limitations are also presented in this chapter.

The fourth chapter presents background information on Kenya and Nairobi including a profile of the study area. Chapter five discusses the findings of the study. It is structured in accordance to the three research questions. It presents the findings on the specific roles local institutions play in facilitating adaptation to climate change in Mathare 4B. It then goes on to present findings on how local institutions interact with extra-local institutions to facilitate successful adaptation efforts to climate change and how different community groups and households gain access to and are able to use assets and resources of local institutions. Lastly, chapter six presents conclusions, pointing out how this study complements previous studies.

CHAPTER 2

2.0 CONCEPTUAL AND THEORETICAL PERSPECTIVES

According to Burton (1997), the improvement of future adaptive capacities of communities will depend on how they currently adapt to extreme events and risks including floods. Several studies including by Grothmann & Patt (2005), claim that factors affecting response to climate variability and weather related risks and are usually similar to those that influence adaptation capacity to climate change in the long term. This is more so in sub-Saharan African countries where climate is exacerbated by other structural and social challenges and adaptation to climate change often primarily entails responding to increase threats of extreme events (Grothmann & Patt, 2005).

2.1 Climate Change and its Impacts

The term climate refers to a measure of the average pattern of variation of prevailing weather conditions such as temperature, humidity, precipitation and other meteorological variables of a given location over a long period of time. IPCC (2007) defines climate change as the change in climate over time as a result of natural variability or human activities. It contends that although the climate has always been changing, the current rate and magnitude is unprecedented largely due to human activities.

Even though there are different predictions with regard to time span and impact (scientists disagree on for instance how fast the Arctic sea-ice is melting), there is a consensus that many natural systems are affected by global and regional climate changes, particularly in terms of increasing temperatures (IPCC 2007). The increase in temperature will have widespread influences, including changes in many marine and terrestrial ecosystems, changes in some Arctic and Antarctic ecosystems, and increased glacial melting leading to increased run-off. Though there are several environmental challenges that the world faces, climate change is the largest, most complex and urgent (Rosenzweig et al. 2011).

According to Ireland (2010), sub-Saharan Africa confronts structural difficulties that exacerbate the effects of disasters and restrict its ability to effectively manage solutions. Its high rural population, population growth, urbanization, social injustice, prevalence of HIV/AIDS and vulnerability to economic and political shocks undermines its capacity to deal with climate related disasters (Ibid). IFRC (2003) notes that in SSA, for example, the HIV/AIDS pandemic is more urgent but adds that experience from the food crisis in 2000 – 2003 clearly illustrated that hazards caused by climate changes combined with vulnerabilities such as poverty and disease create magnify disasters and therefore sustainable development can only be achieved through an integrated approach.

Over half of the World's population lives in urban areas which are key sources of greenhouse gases. Urban areas especially in developing countries are exposed to high risks from climate related hazards due to their high population densities, innate vulnerabilities and political and social processes (Birkmann et al. 2010). Climate change will pressure on cities leading to frequent and intense droughts, inland floods, increased number of heat waves and rise in sea level for coastal cities (Rosenzweig et al. 2011). The existing environmental challenges in cities will be exacerbated by climate change (Haque & Burton 2005). IPCC (2007) reveals that cities are responsible for over 40% of total greenhouse emissions adding to the climate change challenges. It is the most vulnerable urban poor who will bear a disproportionate burden of the effects of climate change (Rosenzweig et al. 2011).

As a result of these challenges, there is a need for cities to think of how changes in climate will affect their long-term development (IPCC 2007). Cities must develop plans on how to face, manage, and where possible totally defend against the risks (Rosenzweig et al. 2011). Heat waves will threaten lives of vulnerable populations such as the elderly. Droughts, floods, and other natural hazards will become more frequent, though the vulnerability of specific cities will vary widely depending on their physical geography, climatology, level of economic development, the quality of governance, social cohesion, and the financial capacity to adjust (Haque & Burton 2005). Rising sea levels may play

havoc with coastal cities, submerging some areas, and making others far more vulnerable to storm surges, or adversely impacting key infrastructure (Rosenzweig et al. 2011).

According to Ireland (2010), the quest towards adaptation to climate change has increased significantly in the last 10 years due to an increase in awareness of the potential impacts of climate related hazards. He however notes that in spite of this impetus, the interaction between climate change adaptation and other strategies that aim at reducing vulnerability and building resiliency is just beginning to garner attention with a wide acknowledgement that societies must adapt to environmental changes. In developing countries, there is an increased trend in loss of lives and destruction of property due climate triggered hazards (Haque & Burton 2005). Næss et al., (2005) suggest that this is even more important at local levels where there exists the most uncertainties and empirical proof that vulnerabilities and their causes are location- specific.

Since the local contexts in which adaptation occurs influences its success in a certain location, adaptation to climate change is fundamentally a local process (Agrawal, 2008). Local adaptive decisions are influenced by both local level interactions along with higher geographical structural connections which support local action (Næss, et al., 2005). Local institutions are an important part of any adaptive process. They embody a culture of continuity and dynamism within a society (Crane 2013). Members of the society use these local institutions to adapt to changes while maintaining a level of continuity and consistency. Therefore although research into role of local institutions in adaptive processes has received little attention, it is nevertheless important (Crane, 2013).

2.2 Vulnerability

People, especially the poor often settle in hazard prone areas as the benefits usually outweigh the risks but which end up exposing them hazards and risks. According to Pelling et al. (2003), weather related hazards and human vulnerability are as a consequence of continuations from the root causes such as global climate change thus emphasizing the relationship between the global and local. For example in Mathare 4B,

many flash floods are as a result of flood control measures upriver, in the Muthaiga Dam. This phenomenon has been referred to as the “*paradox of flood control*” by Wisner et al (2004) where though designed to reduced floods, dams may increase risks elsewhere.

2.2.1 Social Vulnerability

According to O’Brien et al. (2004), there are two interpretations of vulnerability, representing two positions referred to as the analysis “*starting-point*” or “*end-point*”. Starting point portrays vulnerability as a feature produced by various environmental and societal processes, with climate change making it worse, while the end point describes vulnerability as an end result of the impacts of climate change without adaptation. Kelly and Adger (2000) say that the main difference in the two interpretations is their regard of adaptation where vulnerability as a start point supposes that vulnerability influences adaptive capacity and adaptations while the end-point interpretation supposes that adaptive capacity and adaptations influence vulnerability.

Several authors (O’Brien et al., 2004 and Kelly and Adger, 2000) suggest of the importance of determining vulnerability so as to assist in adaptation to climate change. O’Brien et al. (2004) refers to vulnerability as individuals and social groups’ ability to react to, cope with or adapt to external stresses placed on their livelihoods. They claim that vulnerability epitomises the physical, economic, political or social susceptibility of a social group to harm as a result of a destabilizing phenomenon of a natural or anthropogenic origin and that this can be comprehended as the decreased adaptive capacity to weather-related stressors.

2.2.2 Vulnerability and Poverty

Many vulnerability studies point to the close connection between differential vulnerability, inequity and poverty. The most poor have been found to be very vulnerable to climate change but according to Eriksen et al. (2007) poor people are not equally vulnerable to climate change. They concede that poverty is a great contributor to

vulnerability thus weighing on the importance of addressing poverty issues in order to reduce vulnerability.

2.3 Climate Change Adaptation

Garnaut (2008) defines climate change adaptation (CCA) as the adjustment in human or natural systems to actual or anticipated weather changes or their effects that curbs their harmful effects or exploits beneficial opportunities. It is the taking of action in anticipation or response to the impacts of climate change which cannot be mitigated. According to Aakre and Rubbelke (2010), CCA action is carried out by institutions in both the public and private sectors using policies, development of infrastructure and technologies and through behavioral change. There are several typologies that classify adaptation activities including based on purposefulness of adaptation (spontaneous vs. planned), timing (anticipatory vs. reactive), adapting agent (private vs. public) and scope (short-term vs. long term; localized vs. regional).

Climate change manifests itself mainly as gradual changes in average temperatures and precipitation, increased seasonal and inter-annual variations and increment in the frequency and intensity of extreme events which are linked to both slow and rapid-onset hazards (Tompkins and Adger 2004). These hazards, including increasing temperatures and floods leads to greater exposure of urban poor populations through major impacts on their livelihoods mainly through increased strains on prevailing social institutions, increased environmental risks and reduction in livelihood opportunities.

Adaptation is therefore necessary in order to reduce these impacts of changes in climate not only as a result of the inevitability of changes in climate but also because according to IPCC (2007) it helps increase knowledge about future impacts of climate change, mitigates against potential greater future costs of adaptation especially for poor populations, mitigates against potentially larger negative social, economic, and ecological effects of unplanned adaptation and provides existing experience of historical forms of

adaptation which provide strategic lessons about the suitability of different forms of adaptation in different contexts.

2.4 Role of Local Institutions in Climate Change Adaptation

2.4.1 Conceptual Framework

Adaptation measures undertaken in the informal settlements and the role of local institutions in adaptation to climate change were formally studied using the Adaptation, Institutions and Livelihoods (AIL) Framework as proposed by Agrawal (2008). This was adapted to studying local institutions. The framework uses the typology of public, private and civil institutions and draws from social network analysis to propose a linkages framework of local institutions emphasizing on the roles of their partnerships in facilitating climate change adaptation as well as their influence on resource access for different vulnerable social groups (Agrawal, 2008). The framework presents the impacts of climate change influenced by different social ecological contexts (risk institutions) on adaptation practices and household livelihood outcomes.

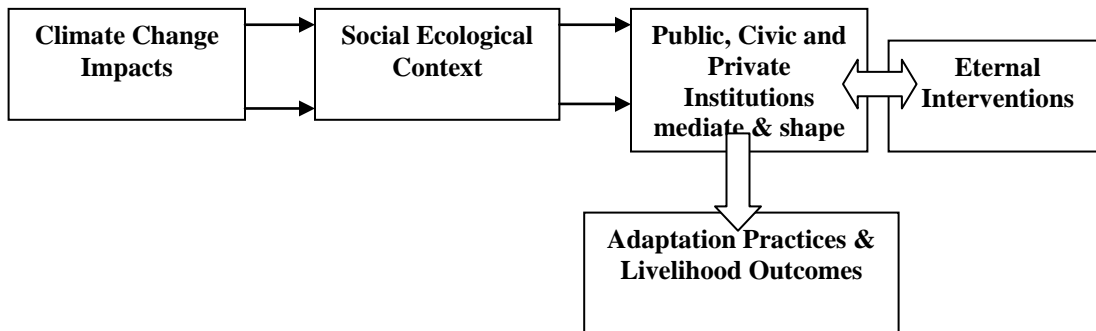


Figure 2.1: Adaptation, Institutions and Livelihoods (AIL) Framework. Source: Agrawal (2008)

Agrawal (2008) argues that when investigating the role of local institutions in adaptation to climate change, it is important to consider three institutions relevant to successful adaptation outcomes which include: their nature and goals, patterns in how specific types of institutions enable certain types of adaptation strategies, and their linkages with each

other and with households. He adds that although historically, many strategies have been used by households and communities in adapting to climate variability, local institutions helps in the capacity to adapt through how they regulate and structure their relations.

2.4.2 Classification of Local Institutions

Review of institutional literature reveals a variety of ways in which local institutions relevant to climate change adaptation can be classified including based on their formality/informality, whether sector specific or multi-sectoral and on their hierarchical nature (IFAD, 2003). However, Agrawal (2008) contends that as regards climate change adaptation at local context, classification of institutions is best done three broad domain of social action which includes: civic, public and private mainly in their formal but sometimes also informal forms. He argues that this classification covers the scope of institutions that are important to climate change adaptation.

The above domains can further be distinguished in several ways. Uphoff and Buck (2006) classify organizations because of their formal and concrete natures highlighting local governments and local agencies (agencies or arms of higher levels of government operating at local levels), similarly identifying two types of civil organizations (membership organizations and cooperatives) and two types of private institutions including service organizations such as NGO's and private businesses/individuals.

2.4.3 How local institutions affect Adaptation and Livelihoods

Agrawal (2008) argues that local institutions influence the impacts of climate hazards on communities and households livelihoods in three key ways: *First, they structure environmental risks and variability and thereby the nature of climate impacts and vulnerability.* A climate phenomenon such as a flood has varying impacts on the livelihoods of residents in a given area. An equitable access to local institutions and their resources together with open communication and governance would reduce the effects of

climate hazards in contrast to a context where access is highly stratified with communication monopolized by a small group (Agrawal, 2008).

Second, local institutions create a motivational framework from which results of individual and collective action unfold. Agrawal (2008) claims that households and collectives select specific adaptation practices within the motivational frameworks provided by local institutions such as closer social networks that make it easier to pool community resources.

Third, local institutions are the media through which assistance from outside the community strengthens or weakens existing adaptation practices. According to Agrawal (2008), for external interventions to strengthen local community's capacity to adapt, they have to focus on the reasons as to why households and collectives prefer one type of adaptation practice to another. For example in informal settlements, social groups not owning their shelters would find it more difficult to build permanent structures that secure their homes against flooding. Agrawal (2008) contends that attending to these empirical patterns is of particular importance as dependence of certain adaptation measures may have permanent consequences for successful adaptation to future risks.

Lastly, local institutions shape the impacts of climate hazards on livelihoods through various institutional functions such as information gathering and dissemination, mobilization and allocation of resources, skills development and capacity building, providing leadership and linking to other stakeholders (Agrawal, 2008). He says that all the above functions can be further divided, however the objectives for which an institution was constituted and challenges addressed over its existence influences performance of any of the functions.

2.4.4 Linkages among Institutions: Access and Articulation

According to Agrawal (2008), in influencing climate change adaptation, the capacity and the interconnections of institutions are of utmost importance. He says that “*institutional*

linkages are critical to adaptation because of the ways in which institutional linkages affect flow of resources and influence amongst themselves and to households and social groups”(8). Institutional linkages are comprised of institutional access and institutional articulation.

Institutional Access

Agrawal (2008) holds that households and social groups in a community will have varying degrees and links to the institutions operating in their locality. For example, while some households may be not connected to a local institution, others may take part in every day running and decision making of an institution. Benefits to households and social groups also differ in accordance to their connections to policies of the institutions while others may be unaffected. Types of benefits received from the local institutions are influenced by the degree and kind of access that households and social groups have to the local institutions (Agrawal, 2008).

Institutional Articulation

This refers to the linkage that institutions have with each other (Agrawal, 2008). He argues that even with the presence of multiple local institutions, each of them will have particular impacts on adaptation depending on their degree of connectedness, if and how they organize their response to climate hazards and lastly their articulation with extra-local institutions and resources. Agrawal (2008) add that institutions that have conflictual connections to other institutions are often less effective as compared to those with multiple positive links. According to Agrawal (2008), institutional articulation including private-social affiliations, co-management and public-private collaborations are important to climate change adaptation and thus the understanding of these linkages is vital in order to learn how local institutions influence adaptation practices.

Agrawal (2008) recommends the use of social network analysis in order to identify, visualize and analyse institutional access and articulation which assist in identifying

important institutions and their capacities, provide a feel of potential collaboration amongst local institutions, entry points for external interventions, flow of resources amongst institutions and to social groups thus being able to distinguish suitable positions of influence in which to direct resources for climate change adaptation with a local context.

2.5 Social Network Analysis

Cross and Parker (2004) define a social network as a social structure that comprises of individuals or institutions that they refer to as “*nodes*” that are connected by some type of symbiosis such as friendship, common interest or beliefs. They add that social network analysis (SNA) looks at structures of social relationships amongst individuals or institutions to understand their informal connections. It perceives social relationships as consisting of actors (nodes) with relationships between them (ties). An actor can be connected to different nodes known as the social contacts with social capital being the measurement of the value obtained from the network (Cross et al., 2005). According to Cross and Parker (2004) the relationships in a social network can either be ascribed or achieved with kingship being a good example of an ascribed relationship. The authors add that achieved relationships often occur in the course of daily interactions with for example a household requesting for assistance from another.

Social network analysis had developed to become an important sociology technique since Barnes (1954) began using it methodically in representing the connections between bound groups such as families and social categories such as gender and ethnicity. Social network analysis started as a descriptive metaphor but has in the last couple of decades become an important analytical approach to studying society (Cross et al., 2005). It conceptualises exchange as characterized by reciprocity, social norms and value orientations (Collins, 1988).

2.6 Chapter Summary

This chapter has provided a theoretical framework for the study. The concepts of climate change and vulnerability have been introduced and these have been connected to that of adaptation. The role of local institutions in climate change adaptation has also been discussed including looking at how institutions are linked to each other and how this can be analysed by use of social network analysis. The next chapter presents the methodology used for the study.

CHAPTER 3

3.0 RESEARCH METHODOLOGY

3.1 Introduction

In the previous chapter, a literature review was presented with detailed theories relevant to the purpose and research assumptions of this study. This chapter outlines the research process. Specifically the chapter presents the following: research methodology, ontological and epistemological considerations, research design, population and sampling, research procedures, data collection, data analysis, research presentation, and the chapter summary.

3.2 Research Methodology

This study drew on qualitative descriptive methodology in order to investigate the research questions. Berg and Lune (2012 p. 3) describe qualitative descriptive research as referring “*to the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things*”. According to Magilvy and Thomas (2009), qualitative research is an enquiry into the everyday life whose purpose is to produce an in-depth understanding of a social phenomenon, social structures and human experiences. Qualitative research methods collect and analyze data focused on words and includes interviews and discourse analysis and is often characterized by proximity and closeness to often a small number of carefully selected respondents (Berg and Lune, 2012).

Unlike quantitative methodology that involves a linear process, qualitative research is cyclical and involves a researcher reflecting on and interpreting data throughout the research process (Magilvy and Thomas, 2009). The research process usually moves through different overlapping phases which provide a flexibility by which a researcher is able to adjust strategy, moving back and forth between theory, methodology and data (Berg and Lune, 2012). They add that the in qualitative methodology, the kind of

research undertaken is ultimately influenced by the researcher's views on such things as ontology, epistemology, goal, the research participants and even the audience to whom the study is intended. It is a naturalistic, interpretive methodology associated with certain data collection methods that include observation, interviews, group discussions and narratives (Magilvy and Thomas, 2009).

In qualitative research, data production is flexible and considerate to local social contexts that are often characterized by close contact between researcher and study population (Berg and Lune (2012). According to Magilvy and Thomas (2009), the outcomes of qualitative research produces detailed descriptions of participants' perspectives of their social setting and strives to answers the questions *'how'*, *'why'* and *'what'*. Snape and Spencer (2003) offer a summation that qualitative research is aimed at providing an in depth understanding of the social world by investigating the social and material circumstances, perspectives, experiences and history of people

The phenomenon pursued in this study is a relatively complex one, of which the researcher thought required an in depth investigation and thus a qualitative research approach was deemed suitable since it seeked to understand the perspectives of people as they experience and understand the climate change phenomenon. Quantitative methodology could have been possible to undertake but the study prioritized to convey people's stories and experiences with the help of their own words. In this study, the objective was to investigate the role of local institutions in adaptation to climate change in urban informal settlements.

3.3 Ontological and Epistemological Considerations

In research, ontology is concerned with beliefs of the nature of the world; the reality while on the other hand epistemology is concerned with issues of how man studies the world and what is considered as acceptable knowledge (Winchester & Rofe, 2010). Constructionism is of the assumptions that the world is made up of multiple realities that

are local and definite in nature and understanding of social world is created by persons via social connections and is in continuous change (Winchester & Rofo, 2010).

This study utilized a constructionist ontological approach. This meant that it assumed the world as socially constructed and acknowledged that social interactions are often complex and thus needed an interpretivist epistemology (Magilvy & Thomas 2009). The use of constructionist ontological approach in this study further acknowledges that findings herein are based on the researcher's personal interpretations of the said socially constructed world. For instance in investigating households and social groups' access to local institutions, findings are based on information sourced from the informants centered on their interpretations of their social reality but needless to say, this was also influenced by the researcher's interpretations of subtleties observed.

3.4 Research Design

Research design is generally a framework for collecting and analyzing data. It refers to the whole study process, beginning from conceptualization of the problem to data generation, analysis and explanation of findings (Magilvy and Thomas, 2009). In investigating the role of local institutions in adaptation to climate change in urban informal settlements, a qualitative case study approach was employed focusing on Mathare 4B village. Magilvy and Thomas (2009) explain that the case study approach involves studying a specific unit(s) or case in details so as to explore their in-depth nuances and complexities and come up with explanations that can be generalized for similar cases.

According to Magilvy and Thomas (2009), case studies can further be categorized into cross-sectional or longitudinal studies. A cross-sectional study refers to research done at one particular point in time while on the other hand a longitudinal study refers to research carried out multiple times for the same case leading to case examination over a long period. Although for this study the researcher visited the field twice, the second field visit was used to fill in gaps in data collected and not in re-examining previous acquired data.

Therefore this is a cross-sectional case study where findings are limited to the period under which the study was done.

3.4.1 Population

Cooper and Schindler (2001) define population as the total collection of elements about which the researcher wishes to make some inferences. The population for this study was all adults (above 18 years) that live in Mathare 4B village.

3.4.2 Sampling Design

Sampling is a research technique where a set of individual units, drawn from some definable population and generally a small proportion of the population, is used to make inferences that are intended to be applied to the population (Berg & Lune, 2012). The study had inadequate resources to obtain a list of the total population in the study site and therefore the population characteristic from which the sample was drawn was unknown. The study used a nonprobability technique where convenience sampling was used. Convenience sampling, also sometimes referred to as accidental or availability sampling relies on subjects that are available or are easy to access (Berg & Lune, 2012).

3.5 Data Collection Methods

This study was carried out in Mathare 4B village of the Mathare informal settlement in Nairobi. This was done in two phases; from 2nd September to 4th October, 2013 with a follow up field visit from 3rd to 14th February 2014. Data collection was done through three main sources based on the research questions using participatory urban appraisal (PUA) methodology. PUA is an intensive, systematic but semi - structured learning experience carried out in the community whose main features include triangulation, flexibility and informality, on-the-spot-analysis and is conducted within the community (Moser and Stein, 2010). Using the voices of poor people in informal settlements, PUA is very helpful to researchers in studying climate change adaptation in urban poor

communities primarily allowing people to express their own ideas and perceptions in an inductive manner (Moser and Stein, 2010).

The data collection methods used included observation, interviews and review of case related documents. Information was gathered from multiple sources in order to triangulate this for validity. Primary data was gathered from the field through observation, focused group discussions and key informant interviews, with secondary data gathered through the review of case-related documents consisting mainly of organization reports with data regarding climate and weather of the area gathered from the Kenya Meteorological Department.

3.5.1 Observation

According to Berg and Lune (2012) observation involves the study of phenomena in the natural settings and involves various approaches such as participant observation, documentary analysis, discourse analysis and conversation analysis. For this study, observation was used by taking transect walks through the community, which Berg and Lune (2012) note that presents the chance to document and examine behaviour and interactions as they occur but without being part of a study population. The transect walks taken and observations made were very important as they allowed the researcher to gather data that was uninfluenced by the study participants and only relied on his interpretations of the observed phenomena.

In carrying out observations, it was important to decide the role of the researcher, in for example whether to participate or just observe, whether to carry out open or hidden observations or the researcher's presence influences the study. Berg and Lune (2012) observe that for observations, researchers should try and understand the participants' situation as much as possible and establish trust with them as this has an influence on the quality of the data gathered. The researcher always took the transect walks through the community accompanied by his two research assistants and in some cases accompanied by a village elder or local group leader thus making it impossible to conduct hidden

observations, which the study did not find desirable anyway. As far as this study is concerned, the researcher's presence in the area did not greatly affect the everyday lives and activities. Even though some people were naturally curious, most were nonchalant to his presence.

Observations were a key element in identifying candidates for FGD's and interviews and also an important source of information that provided an overview of the study area, the general conditions in terms of population, housing, potential hazards such as closeness to river banks, location of organizations amongst others. The transect walks were also important as a way of introduction to and breaking ice with potential study participants which was quite helpful in accessing informants and a '*demystification*' of the researcher.

3.5.2 Interviews

Interviews and group discussions are a form of generated data that comprise of the reconstruction of information and always involves re-telling and re-processing through verbal recounts by study participants (Berg and Lune, 2012). The authors add that generated data is important as it creates an understanding into the participants' values and behaviour and the meaning that they attach to them. They posit that interviews are regarded from two perspectives namely; positivistic which looks at the account of the informant as accurately representing actual events and the constructivist perspective which argues that outer world experiences cannot be conveyed in an interview environment and instead descriptions are usually created during the interviews.

Qualitative interviews may be structured or unstructured and may include objective and subjective questions, main questions, probes and follow-ups (Rubin and Rubin, 2005). For this study, the interview guide used begins with questions about perceptions of weather and weather changes. It then moves to local vulnerability, impacts and adaptation to weather related events. The next question is about which local and extra-local institutions are involved in facilitating adaptation to climate change, specifically mapping their nature and goals. The guide then moves to issues of households and social groups'

access to these local institutions addressing issues of degree and type of access. Lastly, informants were able to add any information that they deemed relevant to the issue under discussion and also ask questions to the researcher. These open questions used as a guide to the discussions were very helpful in having the informants narrate their stories and experiences and also in triggering discussion amongst themselves during FGD's that resulted in a large amount of important data.

The study had also a separate interview guide used in interviewing key informants representing local and extra-local institutions. Here the guide sought to find out about the agendas of the extra-local institutions relevant for climate change adaptation in Mathare 4B, what policies and entry points that were used to pursue their objectives and how these policies affected the local institutional dynamics.

Before commencing data collection in Mathare 4B, a pilot study involving 3 focus group discussions was done in Kosovo village which borders the study area. This study carried out over a period of two days, was aimed at testing the data collection tools. This was done through use of both primary and secondary sources where 3 group discussions and 4 key informant interviews (KII) including with the village elders and area chiefs (local administration) were done.

During the pilot study, it was recognized that the locals had an understanding about weather and its variability and how this impacted on their daily lives. The researcher also realized that important local institutions engaged in climate change adaptation were not only confined to formal and informal organizations but also certain individuals within and from outside the community. Lastly, from the pilot study, it became apparent that use of climate change as term was not appropriate for the context but instead the terms "*weather*" and "*weather changes*" more successfully elicited responses that were helpful for the study. The necessary modifications were made in the data collection tools to reflect the local context and findings from the pilot study. The information collected from the pilot study is not part of the findings in this thesis.

During the first week of the study, the focus was on building relationships and collecting community information of the study area. First, the researcher with the help of the research assistants established contacts with two village elders, who then introduced them to the local administration, other elders, community social groups and the police. In addition transect walks were carried out accompanied by some community leaders in order to be introduced to different households and social groups that could participate in the study. This was important as an ice breaker and it assisted in dispelling suspicion of the researcher as an outsider and was also a mechanism of first contact with a variety of community members.

From 9th to 21st September, 27 FGD's were carried out in Mathare 4B. In addition to these, a workshop was carried out in the community hall with the facilitation of Mathare Safety Team attended by 31 residents. It involved the use of games developed by the Red Cross Climate Centre to elicit knowledge of climate related hazards and adaptation measures undertaken. In addition to the FGD's, 9 KII's were carried out with representatives of local and extra-local institutions to specifically gather data for research question 3.

A follow up field study was done for 2 weeks between 3rd and 14th February 2014 whose main aim was to fill identified gaps in the collected data mostly related to research question three on the degree and type of access that different households and social groups had to local institutions involved in climate change adaptation. During this phase, a total of 12 FGD's and 4 KII's were conducted and thus leading to a total of 39 FGD's, 13 KII's and a workshop done during the whole study. The FGD's were comprised of between 6-10 persons and although some were centralised at a local disaster response centre, most were held at locations where respondents were located for example at construction sites and business premises.

3.5.3 Literature Review

Previous literature and research regarding the study area and related to the research questions was assessed so as to determine the profile of the study area and background information about livelihoods, vulnerability and adaptation measures taken by residents of Mathare 4B. Literature review was used also to assist in outlining the role of local institutions in adaptation to climate change that helped in developing themes and the placing the findings in their correct contexts as well as having assisted the researcher in orientating himself to the processes of field research.

3.6 Data Analysis Methods

Data analysis was undertaken in line with the research questions beginning with a thorough analysis of the collected raw field data. First, the data gathered was transcribed word for word into a computer from recordings of interviews, discussions and field notes. This process was very involving and took much more time than had been anticipated especially with having been to the field twice. The data was then classified and structured using an *issue-centered analysis* which according to Berg & Lune (2012) entails the comparison of information involving different issues and topics in relevance to the research questions that enables the emergence of themes. Emerging themes were colour coded to highlight thematic categories mainly related to the research questions but also including profile of the study areas, community perception on weather and vulnerabilities to severe weather. According to Berg and Lune (2012) colour coding is process that involves the assignment of different colours to statements in relation to pre-classified categories.

3.7 Data Quality Considerations

3.7.1 Reflexivity

Gilgun (2010) describes reflexivity as a researcher's influence on the material and research process. She argues that a researcher's predispositions and living realities impacts on different aspects of a study. For this study, the researcher's background of having worked for an International Non-Governmental Organization (INGO) within informal settlements of Nairobi, which the study established to be also a key extra-local actor probably influenced many aspects of the study. The study sought to limit this influence through the use of various approaches. The choice of study location and topic were probably influenced by a feeling of closeness that the researcher had previously been involved in the management of disasters in informal settlements. This study sought to lessen this influence by focusing on the role of local institutions and looking at adaptation to only weather related hazards.

Another area where the researcher could have had an influence was in conducting the field work as this was made under limited time constraints. To reduce the effect of this to the study, a participatory methodology which according to Moser and Stein (2010), builds on a well-established set of principles and practices was used. Participatory methodologies in research were first developed by Robert Chambers and colleagues while conducting participatory rural appraisals (PRA) of poverty in an effort to recognize the importance of hearing local people's voices and priorities (Moser and Stein 2010). Participatory methodologies focus on groups that are representative of the community members in terms of gender, age, ethnicity, economic activities and other culturally specific variables.

Finally, the researcher's influence was also on data analysis as would often be expected in a qualitative study. Having been involved in development activities in informal settlements and not the least now residing in a high income country, the picture of local residents could easily become one of destitution and vulnerability. It therefore generally

became very important to separate the researcher's thoughts from informants' views so that they could not guide the focus and lay ground for the analysis. However, the researcher having spent a total of eight weeks in the field coupled with the use of participatory methodology assisted in shaking off the initial perceptions to a great extent.

3.7.2 Trustworthiness

Shenton (2004) notes that trustworthiness of qualitative research has repeatedly been queried especially when it comes to validity and reliability issues. He however notes that four criteria: *credibility, transferability, dependability and conformability* should be practiced by qualitative researchers in pursuit of a trustworthy study.

Credibility

Credibility is comparable to internal validity in quantitative research. It deals with the congruence of the study to reality. Most important to a researcher, is whether the methods selected are the best in answering the research questions (Shenton, 2004). In order to enhance credibility, this study incorporated several measures. First it adopted a research method that is well established in climate change science and has been used in several previous studies (Agrawal, 2008, Moser et al. 2010). The researcher also first familiarized himself with the everyday ways of life of the study population making preliminary visits to the field of study prior to initial data collections dialogues. This was important in establishing understanding and establishing trust between the researcher and study participants.

The study also used triangulation by using observation, FGD's and individual interviews in order to compensate for each method's individual limitation as data collection strategies. Secondary documents including reports and photographs were also used to corroborate particular information that had been supplied by the informants and in particular documents created by some of the formal local institutions. Another form of triangulation was the use of a wide range of informants through which personal

experiences and opinions were verified against each other's which enabled the researcher to eventually construct a vivid picture of the attitudes and behaviour of the study participants.

Transferability

Shelton (2004) writes that transferability is comparable to external validity in quantitative research where the aim is usually to show the extent to which a study can be applied to other circumstances. However, he adds that since the sample size in a qualitative study is often too small and not demographically representable, it is usually aimed at achieving an analytical generalization to transfer knowledge to other contexts. Denscombe (1998) presents a similar argument suggesting that if researchers think that their situations are the same as that described in a study then they may associate the results to their own findings.

In view of the above opinions, this study cannot make transferability inferences. However, the researcher took several measures to assist readers in making their determinations on how far they can be confident in transferring the results and conclusions presented, to other urban informal settlements. For example, a thick description of the phenomenon under study has been provided so that readers can have adequate understanding of this, thus enabling them make comparisons of the phenomenon herein described to those emerging in their own circumstances. The scope of this study has also been provided as suggested by Shelton (2008) including clear conceptual definitions, data collection methods used, type of people who provided information, the length of time over which data collection took place and lastly the number and length of data collection sessions.

Dependability

Dependability in qualitative research is comparable to reliability in quantitative research (Shelton, 2008). He notes that due to the changing nature of phenomena studied in

qualitative research, repeating a study in the same context using the same methods and with the same participants may not lead to the same results as a researcher's and the respondent's conversation, the time in which it happened can never be re-staged. Shelton (2008) however adds that there are close ties between credibility and dependability and in demonstrating credibility; a study does in some way ensure dependability. He suggests that consistency may be achieved by using overlapping methods such as focus groups and individual interviews as well as by providing a detailed report of the study processes in order to allow another researcher replicate this in future.

In this study, the researcher has provided a detailed description of study design and how it was implemented including making notes on the operational detail of gathering data tackling details of the field work and also offering a reflective assessment of the study in order to review the effectiveness of inquiry process carried out. Through this, the researcher hopes that it would be possible for another researcher to follow the study process undertaken.

Confirmability

Confirmability is related to objectivity in quantitative research. Shelton (2008) associates confirmability with neutrality of the data rather than that of the researcher contending the difficulty of maintaining real neutrality as even data collection instruments are developed by humans thus making the researcher's intrusion inevitable. He however points out that it is important to take measures in ensuring that findings of a study reflect the experiences and opinions of participants rather than those of the researcher.

To try and ensure confirmability, triangulation was important in ensuring that the chances of researcher bias were reduced. In reflecting on the study process, the researcher also noted his predispositions and ensured that there was an "*audit trail*" in terms of a detailed methodological description which allows any other researcher or observer to trace the research process through decisions that were taken and the procedures

described. The research assistants that were present during all interviews were requested to audit the results.

3.8 Ethical Considerations

Berg and Lune (2012) argue that social scientists have a great obligation to their colleagues, study populations and the society in general because they delve into the private lives of other human beings from which policies, practices and laws may result. Research ethics involve issues of harm, consent, privacy and confidentiality of data and therefore ethical awareness during an entire research process is fundamental.

Prior, to travelling to Kenya, consent for this study was applied for from the Kenyan Ministry of Education of which approval was obtained on the undertaking that common ethical guidelines for social scientists including those required for research in Kenya will followed during the entire study process. The ethical guidelines required revolved around doing no harm to participants, the acquisition of participants' informed consents, respecting participants' privacy, not deceiving the participants in any way and lastly maintaining confidentiality of information gathered.

In the field, the biggest dilemma was to explain to the participants how the study was going to be of help to them as many of them had expectations of concrete results and pointed out to the trend of "*outsiders*" doing research in their community but never to be seen again. Lewis (2003) points out to the possibility for researchers giving back, especially after end of a research process possibly by organizing projects or delivering data to local governments as a positive contribution to the community. He asserts that a researcher however has to be aware of his constraints as regards reciprocity arguing of the importance of maintaining objectivity and neutrality. With the help of the research assistants who were actively involved in disaster risk reduction projects in the community, the researcher was able to overcome this challenge with a promise that hopefully this study would contribute to previous studies in the understanding of their community and result in increased interests in climate related adaptation projects.

As regards the issues of harm, consent, privacy and confidentiality of data, all study participants were informed of what the study involved and that participation was voluntary and they all had a right not to answer any question and that they could withdraw themselves or any information provided from the study anytime during the process including after interviews. Participants were further informed that the study will in no way make use of their names or provide any information that may reveal their identities, even though during interviews and group discussions the names of all participants were noted down after receiving their consents. The study proceeded with only the participants that willingly gave their informed consents.

Another dilemma regarded mainly personal requests made by some participants. Even though the researcher emphasized a lot of times that he was a student and that the primary goal of the study was to meet the requirements of his Masters course, some participants requested for his assistance in securing jobs or donations for their groups. Many of these requests would often come at the end of interviews probably as an attempt to receive something back for their participation. However, even with this experience, the researcher was still not able to overtly mention that these things he could not do before interviews as it was a minority of participants that made these requests and doing so would have been construed as condescending and create a negative vibe during interviews and discussions.

The study also considered the importance of protecting participants' integrity. Many of the participants were extremely poor and faced difficult challenges in their daily lives. As a result of this, even a topic like climate change that would generally be considered not too sensitive took on a sensitive turn as a result of the associated problems. The study avoided asking questions of a personal matter although the trend was for many of the participants especially during FGD's to talk of their personal situations. There was emphasis that participants could only talk about the things that they felt comfortable to say to not only the researcher but also to other participants as confidentiality of what they said during FGD's could only be guaranteed from the researcher's end.

3.9 Chapter Summary

This chapter has covered the research methodology in detail giving an outline of the design of the study. The study is qualitative employing a case study approach. This chapter has also explained the data including collection and data analysis methods while also presenting ethical issues that will be considered.

CHAPTER 4

4.0 THE STUDY AREA

4.1 Kenya and Climate Change

Kenya is a developing country that strides the equator in Eastern Africa, sharing borders with Uganda, South Sudan, Ethiopia, Somalia, Tanzania and the Indian Ocean to the south east and has a total area is 582,650 square kilometers. The country has a warm and humid climate with main rainy season extending from March to May. The temperature is relatively high even during the rainy season with the hottest period being February and March and the coldest in July and August.

The population in Kenya is estimated to be around 44 million with a majority living in rural areas and employed in agriculture. The population growth rate was about 2.5 percent as per the 2009 national census, a rate substantially below that of the early 1980s, when Kenya's growth reached 4 percent, the highest rate in the world (GoK, 2009). It has a diverse population consisting of about 42 ethnic groups with 22% of the population ethnically Kikuyu. Other large ethnic groups include the Kalenjin, Luhya, Luo, Kamba and Kisii. Non-African Kenyans make up about 1% of the populations and consists mainly of Asians, Europeans and Arabs (GoK, 2009). The main religion is Christianity (83%) and the two official languages are Swahili and English (CIA, 2012).

The past 50 years of Kenya's history include a struggle for independence from Britain, a period of one-party governance, followed by a more democratic multi party governance type under a presidential representative democratic republic with Uhuru Kenyatta as president (CIA, 2012).



Map 4.1 Map of Kenya (CIA, 2012)

According to GoK (2010), there is unmistakable evidence of climate change in Kenya with recorded rising temperatures and irregular, unpredictable and sometimes intense rainfall in many parts of the country. The Kenya Climate Change Response Strategy Paper (GoK, 2010) claims that minimum and maximum temperatures have been on the increase since the 1960's depending on regions and seasons. The historical temperature trend for Nairobi is shown in the figure below.

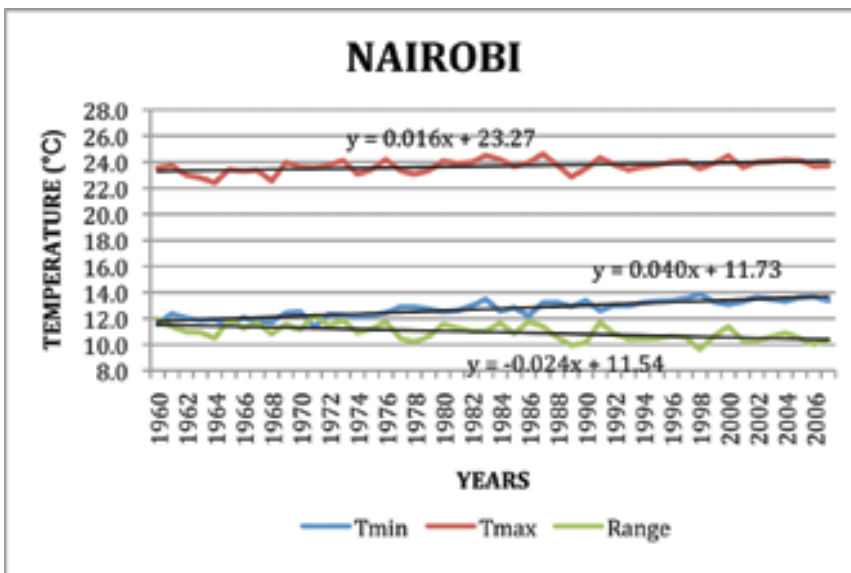
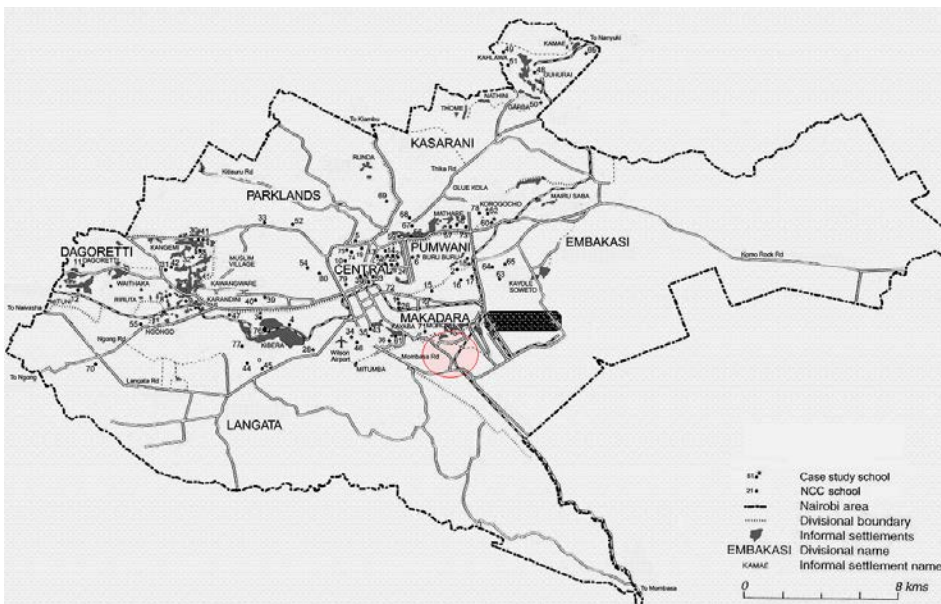


Figure 4.2: Nairobi's temperature trend (GoK, 2010).

GoK (2010) also claim of a yearly variability in rainfall with a general decline during the main rainfall season (March – May) leading to more frequent and prolonged periods of drought during this period. The paper however notes increased rainfall trends during September – February period that has historically been the short rain period (October – December) and spreading into the first two months of the year which are usually hot and dry.

4.2 Nairobi

Nairobi was founded as a railway town during the construction of the Kenya-Uganda railway. Nairobi, meaning “*place of cool waters*” in the local Maa language had its population expand rapidly from an initial 5,000 in 1902 the current estimated population of 3.5 million people (Maleche and Opiyo, 2006). The rapid population increase in Nairobi mostly as a result of poor regional development policies that have promote rapid rural-urban migration has led to the expansion and growth of the city resulting in a myriad of challenges including poor waste management systems, environment dilapidation and emergence of informal settlements (Maleche and Opiyo, 2006).



Map 4.2: Nairobi Metropolitan Area

4.3 Mathare Informal Settlement

Mathare informal settlement is located about six kilometres northeast of Nairobi's city centre and covers an area of 3 square kilometres. The settlement is located in area that is prone to catastrophes characterized by frequent flooding, landslides and other environmental hazards. The transect walks carried out in the area revealed that most of Mathare is situated on an abandoned quarry, with housing structures sitting on the edge and bottom of the quarry pits. Other residents have built their houses and business structures on the riparian reserve at the edge of the two rivers. It is made up of six wards each made up of several villages or sub-locations.

Mathare 4B is part of the Mabatini (*meaning iron sheets in Swahili*) ward and is situated on government land on the confluence of rivers Gitathuru and Mathare that form part of the Nairobi river basin. According to the last Government of Kenya (GoK, 2009) official census in 2009, the population of Mathare was 193,416. The same census presented the population of Mathare 4B as 14,260. The land on to which Mathare 4B sits belongs to the government with residents not having tenure rights to it. However, there was observed distinction between residents as some owned the houses there and a majority rented. Many of the shanties in the area measure about 10 feet squared and are built mainly of corrugated iron sheets. However, the transect walks also revealed some shanties with mud walls and others made of bricks.

None of the shanties had inbuilt toilets but public toilets mainly operated by youth groups as an income generating activities were available at a cost to residents. Many of the respondents in the study however lamented of the inconvenience of these public toilets as they were inadequate, not affordable to most residents and all of them were shut at 2000 hours in the evening. Many of the residents therefore relieved themselves on open fields and in between the shanties a fact that was observed during the transect walks. Residents have access to illegal electricity tapped from electric poles and charged to households by

the “*distributors*”. Mathare 4B has one private primary school but lacked any health care facility or playground.



Map 4.3: Mathare Informal Settlement in Nairobi (Corburn et al., 2012)



Photo 4.1: Housing structures built on edge of quarry (MST, 2013)



Figure 4.2: Shanties built at the bottom of quarry pits (MST, 2013)

4.4 Community Perceptions of Weather Conditions

Information on vulnerability of Mathare 4B and Kosovo villages to severe weather was obtained directly from study participants in the form of brainstorming and storytelling. Many of the respondents were ignorant of the climate change concept but many with varying degrees and knowledge about weather variability mainly from personal experience. Many of the older participants observed that the weather had changed greatly from an average of 20 years before, mostly characterized by long dry seasons with severe heat and short rainy seasons with much rain. There was also general consensus that the seasons had changed and were more unpredictable. For example many pointed out that in September and October 2014 (the period of the first phase of the study) the weather had been very cold contrary to being wet and warm as was before.

When asked their opinions on the reasons to the weather changes, several older participants suggested that this was a curse from God for the many sins that humans were committing. However, in several focused group discussions, some participants believed the weather changes to be as a result of global warming and climate change which many claimed to have had through the radio. Several participants narrated how 15 years before, the whole of Mathare was surrounded by a forest and there were also many trees in the villages which had all been cut down. This, they attribute to be a cause of change climate as the lack of trees caused a lack of rainfall and also in times of heavy rains attributed to the more frequent floods experienced.

A village elder also attributed change in climate to industrial smoke from factories. He pointed out that Mathare bordered Nairobi's Industrial area where factories released much smoke into the atmosphere and was a cause of global warming. He said that he had heard from the radio that industrial smoke was a cause of global warming and therefore this could be true in Mathare 4B and Kosovo too.

4.5 Vulnerability to Severe Weather

Adger et al. (2007) describes vulnerability to severe weather as the scale to which a system is disposed to adverse effects of climate variability and extremes. Vulnerability is therefore the sensitivity of a population to certain impacts related to or caused by severe weather, the degree and nature of exposure by the population to the impacts and the capacity of an exposed population in coping or adapting the impacts (Adger et al., 2007).

From discussions with the study participants, residents of Mathare 4B face multiple stressors and hazards in their everyday lives. Many respondents narrated of facing both physical and social vulnerability to multiple hazards and risks. Residents of Mathare 4B live in an urban environment that is extremely degraded lacking proper waste management and sanitation systems. Fires, floods, landslides and rock falls were identified as having been the most severe in terms of loss of lives and property but

heatwaves and droughts were also identified to be frequent and impacted negatively on the health of the community.

Using timelines and stories, many participants narrated how floods had become frequent as a result of flooding of the rivers Mathare and Gitathuru. They said that these often left many households homeless as the flood waters swept away the shacks closest to the river banks and sometimes resulted in deaths. For example in April 2014, floods had struck Mathare 4B and had destroyed more than 120 houses and caused the death of an old disabled man and two infants. The frequency of the floods and narration of deaths and damages to property seemed to be frequent as there was a major occurrence every year going back to the last seven years with increased frequency every year.

Some of the respondents theorized that the cause of flash floods in the area was not directly as a result of rainfall but was as a consequence of a golf club in an upmarket neighbourhood up river known as Muthaiga opening the flood gates to a dam. However, the researcher could not ascertain the validity of this claim although the presence of the dam was confirmed.



Photo 4.3: Aftermath of flooding in Mathare 4B (Mwelu Foundation, 2013)

4.6 Adaptation to Weather-related Hazards

Many of the respondents interviewed expressed views of being neglected by the government and thus had to fend for themselves. However, in some of the discussions, some participants lamented the fact that many in the community sat on their laurels waiting to be spoon-fed by the government. Despite these views, residents of Mathare 4B are not passive to weather-related hazards and do respond to hazards by taking some adaptation measures.

Many of the respondents identified housing as the most important measure of adaptation to climate change as it fulfilled the most functions in their everyday lives. Respondents pointed out that many residents not only used their houses as living quarters but also as business premises. They said that many residents doubled parts of their houses as salons, retail shops and even daycare centers. This was one way of adaptation as the added income from the houses could be used for example to rent a safer house after a weather-related hazard.

Through the use of participatory methodology tools including story-telling and brainstorming, the study participants related the various ways in which they adapted against severe weather. To protect their houses against flooding many recently built shanties had plastic bags in their foundations and walls to make them more water proof. Some residents built stone foundations or wooden stilts on which their houses rested on and also digging of drainage trenches around the houses, evidence of which was seen during the transect walks.

Other adaptive measures included moving to higher grounds and the planting of napier grass along the river banks and use of sand bags to act as buffers in case the rivers burst their banks. Discussions also revealed that owners of houses were rebuilding them looking stronger materials such as bricks to make them more weather proof although this had the effect of increasing the costs of renting and thus those that could not afford them moved to even more vulnerable areas such as right on the river banks where housing was

cheaper. Some of these adaptation measures were planned while others were in reaction to hazards.

It was interesting to learn that these adaptation measures were not always positive and sometimes led to conflicts between neighbours. A lady in an FGD of 4 women operating a hair salon narrated how their row of houses were affected by incessant flooding after their neighbours in the opposite row had built drainage trenches that drained water on to their door steps not only increasing the vulnerability of the houses to flooding but also creating the problem of mosquitoes as a result of the stagnant water.

Many of the adaptation measures taken by individuals were simple short-term solutions against weather-related hazards. It was explained that this was so because many of the residents rented their housing structures and would often seek new shelter after hazards. Other respondents pointed out to the lack of resources to undertake long-term adaptation measures. A village elder in an FGD with a group of 7 men pointed out that some people including him did not regard taking adaptation measures as a priority as they were only living in Mathare 4B temporarily. However, it turned out that he had been living in the area for 17 years and although he harboured aspirations of one day moving, he had neither the plans nor the means of doing so in the immediate future.

Of course it was then natural to ask of the source of the knowledge and strategies that residents employed in adapting to weather-related stressors. Some of the respondents claimed that some adaptation measures were individual ideas but many pointed out to the important role played by both local and-extra local institutions in facilitating this.

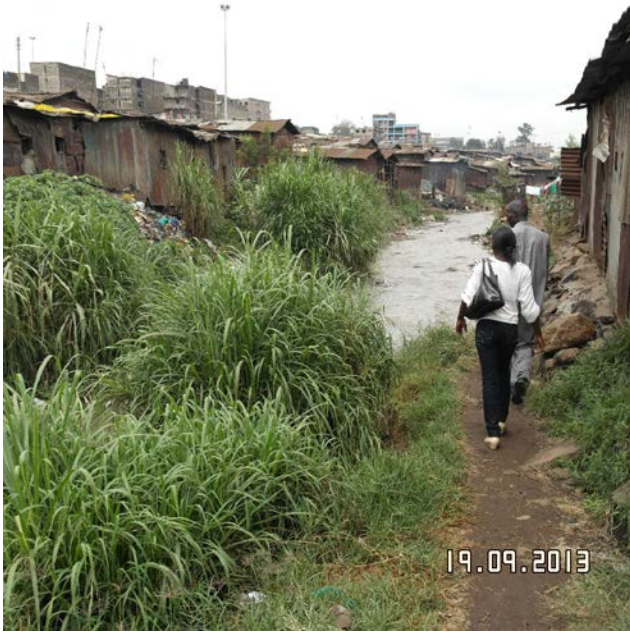


Photo 4.4: Napier grass grown on river bank (Ochieng, 2013)



Photo 4.5: Shacks built on stone foundation (Ochieng, 2013)

CHAPTER 5

5.0 FINDINGS AND DISCUSSIONS

Residents of Mathare 4B village exhibit vulnerability to multiple stressors and shocks where they face multiple risks and hazards. Their living conditions are appalling with many living in degraded environments such as on flood plains and at the bottom of quarry pits without proper sanitation and waste management facilities. In this chapter, gathered data will be described using the research questions and the theoretical perspectives as guidance.

5.1 Role of Local Institutions in the Adaptation to Climate Change

Crane (2013) posits that the comprehension of the role of institutions in climate change adaptation and how they respond to extreme weather events is important in knowing how poor people respond and adapt to weather-related stressors. He adds that the reason for this is because local institutions have in the past shaped the response of the poor to climate stressors. According to Agrawal (2008), these local institutions are also the means of interpreting impacts of future interventions that are intended to facilitate climate change adaptation. As adaptation to climate change is a local process, it is therefore important to understand the role of local institutions in shaping adaptation to climate change.

From the FGD's and interviews with key informants, the study found out that there were several local institutions that were actively involved in facilitating climate change adaptation. Using data gathering tools such as institutional mapping, brain-storming and in-depth discussions, respondents identified the local institutions that they believed played an important role in assisting them deal with and adapt to the impacts of severe weather (see Table 5.1 below).

Institution	Type	Form
Neighbours, friends and relatives	Civic	Informal
Self-help groups and Cooperatives	Civic	Formal
Prominent individuals (Chandaria, Wanjiru)	Private	Informal
Kenya Red Cross (Extra-Local)	Private	Formal
Mathare Safety Team	Civic	Formal
The Church (Matendo Church)	Civic	Formal
MSF-Belgium/Blue House (Extra-Local)	Private	Formal
Member of Parliament	Public	Formal
Community Development Committee	Civic	Informal
Constituency Development Fund (CDF)	Public	Formal
Local government	Public	Formal
Local administration	Public	Formal
Women/Youth Funds	Public	Formal
Kenya Women Trust Fund	Private	Formal
Kenya Metrological Department	Public	Formal

Table 5.1: List of Institutions facilitating CCA (Based on Responses from 32 FGD's)

A review of the Table 5.1 indicates a high variation of local institutions involved in climate change adaptation in Mathare 4B comprising of an overwhelming number of formal but with a few informal institutions too. Public and civic local institutions are also highly represented with a few private. Neighbours, friends, self-help groups and prominent individuals were identified as the most important local institutions in providing moral support, immediate relief and assistance just before or soon after weather-related hazards. Formal civic organizations were identified as most useful in mediating adaptation strategies especially through interactions with extra-local institutions.

Data gathered showed that many of the local institutions had overlapping goals and many had very close connections with each other, sometimes with the same persons having positions of authority in multiple local institutions. Agrawal (2008) notes that many local

institutions facilitating climate change adaptation usually enter into partner associations, advocating for cooperation across different domains. He adds that the main motivation behind such collaborations is usually lack of adequate capacity or expertise to facilitate adaptation which through cooperation each institution may overcome the weaknesses of its partner. Success of collaborations amongst local institutions is largely dependent on shared views about the challenge to be tackled and coordination of strategies to achieve adaptation objectives (Agrawal, 2008).

As a result of the collaborations and intertwining of local institutions in Mathare 4B, their roles in terms of facilitating climate change adaptation is not be discussed in terms of what the nature and goal of each local institution is, but by distinct categories of areas within which multiple local institutions focus on and sometimes collaborate.

5.1.1 Food Production Strategies

Discussions with many groups pointed to one of the most severe consequence of weather changes was increase in food prices. Respondents narrated how drought and poor harvests upcountry had reduced the amount of food available to Nairobi residents and therefore increased food prices exponentially. It was revealed during discussion with respondents in different FGD's that local institutions especially community based organizations (CBO's) and women/youth self-help groups were most active in facilitating urban agriculture and promotion of local food production strategies. As one lady during an FGD with 4 women selling groceries pointed out:

“Before you could go to the market with 50 shillings and buy groceries enough for the whole family for the day. But now you get only two bunches of ‘Sukuma wiki’ for that”.

Many women and youth groups were actively involved in food production activities mostly along the river banks but also in open spaces including growing vegetable in gunny bags. The community has increasingly adopted urban and peri-urban agriculture as an adaptation measure not only to increase food availability to their households but also

to supplement their incomes in lieu of increasing in food prices. Adoption of urban and peri-urban agriculture requires the acquisition of agricultural outputs and technology, knowledge about urban food production a role that local institutions have been able to mediate.

Photos 5.1 and 5.2 below depict two of the many urban agricultural farms that were observed in Mathare 4B. These farms were operated mostly by women and youth through cooperatives and CBO's mostly through collaborations especially in terms of information, technology and inputs with extra-local institutions. Solidarites of France and the Ministry of Agriculture were the two extra-local institutions active in facilitating food production strategies in collaboration with the local institutions.

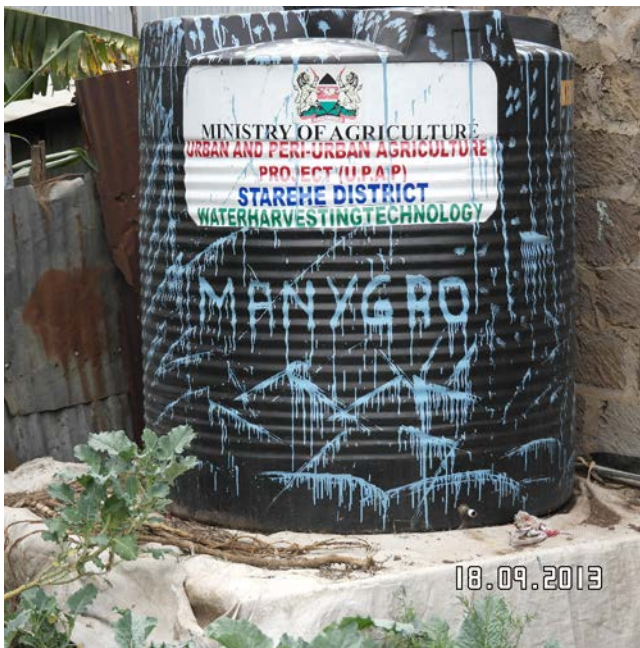


Photo 5.1: Urban agriculture farm (Ochieng, 2013)



Photo 5.2: Greenhouse in Mathare 4B (Ochieng, 2013)

With urban agriculture being relatively new response in adaptation to climate variability in Mathare 4B, timing of planting for outdoor food production is an important strategy that they have to vary in encountering climate variability. In an FGD with a youth group known as Manygro, the respondents said that local institutions and in particular Mathare Safety Team was important in assisting the community in effectively utilising timing of

planting by providing weather forecasting information from the meteorological department. Local self-help institutions also mediated the ways in which labour was accessed by for example having their membership work in the urban farms for free in return to some part of the harvests. The local institutions are also important in interacting with formal organizations in marketing of the local produce and access to credit for their members.

5.1.2 Environmental and Waste Management Issues

Many of the local institutions especially the youth groups are focused on environmental and waste management issues in their quest to facilitating climate change adaptation measures. Mathare Safety Team (MSF), Myto and Manygro are the most active local institutions focusing on the environment with the understanding that deforestation is a key driver of climate change while poor waste management system clogs the drainage system leading to floods and health hazards.

The Chairman of Manygro believes that deforestation and throwing waste into the river increases the vulnerability of residents to weather-related hazards and increased the severity of the impacts of the same. He observed that:

“Planting trees and other vegetation along the river banks and unclogging of the drainage system of waste including improving of waste disposal is the only way to change the weather. People have to know that the weather is worse because they cut down all the trees and they throw trash everywhere”

The local institutions facilitated activities involving environmental clean-ups around the area and also were involved in the distribution of large plastic bags in which residents could disposed of their waste to be collected on certain days at a minimal fee. Additionally, all the three groups operated tree nurseries with projects targeting mostly school children and women groups.

5.1.3 Systems of Social Support/Social Capital

From the group discussions, respondents commented on the availability of some form of social-support mechanisms although very informal and not community wide. These informal safety nets play an especially crucial role in the emergency/recovery phase of weather-related hazards and thus did not play an important role in buffering vulnerable residents against impacts of these hazards. Neighbours, friends and relatives were identified as important institutions in providing short term shelter and in restocking of lost household items after floods.

Matendo church also had a program through which residents of Mathare 4B could shelter in the church hall for 2 nights following the aftermath of a disaster and here they could be provided with mattresses and blankets. The Kenya Red Cross and MSF-Belgium through a local institution (Mathare Safety Team) were also identified as important institutions in providing immediate relief goods and other social support that was important in the adaptation to climate change. Self-help groups known locally as “*chamaas*” contributed cash to assist affected members get back to their feet thus aiding in maintaining livelihood stability amidst extreme weather-related stressors.

5.1.4 Disaster Risk Reduction/Emergency Response

Focused discussions and interviews revealed that one local institution was very active in disaster risk reduction activities in including emergency preparedness. Mathare Safety Team (MST), a local community based organization was seen by many respondents as the most important player in climate change adaptation in Mathare 4B. MST had a program in collaboration with the Kenya Red Cross where they used games to disseminate climate change and DRR information. During the workshops organized by MST on behalf of this study, it was observed that the methodology was useful in not only transmitting important information but also for sharing adaptation strategies already practised within the community. However, it seemed that dissemination of adaptation

measures did not always translate to action within the community. One workshop attendant observed that:

“Before MST and Red Cross started with this program, we used to just sit and wait for the floods to come and thereafter rebuild or find new houses. But now we know a lot of people know what to do even if sometime others do not do what they are supposed to”.

Some local institutions including the local government, Matendo Church and some prominent individuals were also involved in relief distribution after hazards. Although such activities could be considered as short term coping strategies rather than longer term adaptation measures, these institutions seemed to have come up with ways of stock-piling relief material in anticipation of hazards and disasters thus making the measures more planned than anticipatory. For example the local District Officer’s office pointed out that they always had emergency food rations in store adequate for distribution to up to 100 households in case of disasters.

5.1.5 Economic Empowerment

Nearly all the local civic institutions involved in climate change adaptation were also involved in economic empowerment activities for their members through operating income generating activities and cooperatives. These institutions viewed climate change as a single factor amongst many stressors that increased the vulnerability of the community to hazards and therefore endeavoured to reduce this vulnerability by promoting economic development.

The Chairlady of Tusaidiane Women Group viewed the focus on economic empowerment of Mathare 4B residents as a way of improving the status of women and gender equity as well as building the adaptive capacity of residents to climate change. She said that:

“We have to build our capacity especially as women and youth in order to increase our options”

She noted that broadening the livelihood options of residents would bolster their ability to adapt to changes in climate. Tusaidiane Women Group for example was involved in supporting the women in the group by training them in business skills and providing them with micro finances for small business start-ups.

While economic empowerment programs do not directly facilitate climate change adaptation, they however offer the possibility of promoting adaptation amidst the environmental stressors confronted in the area by assisting the residents expand their sources of livelihoods and through the facilitation of flow of resources between local and extra-local institutions.

5.1.6 Facilitating Weather and Climate Information

Mathare Safety Team (MST) was the only local institution that was involved in accessing information and resources about the weather and climate change. In its strategic document, it refers to facilitating interaction and flow of weather and climate change information and knowledge as one of its goals. Through formal linkages with various extra-local institutions including the Ministries of Environment and Urban Planning, Meteorological Department, the National Disaster Response Centre and Kenya Red Cross in accessing and sharing weather forecasts and climate change information.

The Chairman of MST noted that climate change resources are very few in Nairobi and almost non-existent in the informal settlements and there was therefore a need to improve access of information at local levels to enable people to act appropriately. For the residents of Mathare 4B, weather variability made prediction more difficult and therefore many people were usually caught unawares by heavy rains or heatwaves. MST is involved provide an early warning system service by collecting and disseminating information at local level and dissemination of emergency alerts to residents and the authority. As a result of this, MST Chairman believes that it is important to adapt to what is already taking place.

In summation, the study found out that local institutions were varied in nature and also clearly had different levels of involvement, capacity and focus in facilitating climate change adaptation in the area. The table below summarizes these roles.

Area of Focus	Local Institutions
Food Production Strategies	Manygro, Myto
Social Support	Neighbours, friends, relatives, Matendo Church, Chandaria, Member of Parliament
Environmental and waste management	MST, Manygro, Myto, Tusaidiane
Disaster risk reduction and emergency relief	MST, Local Government, Matendo Church
Economic empowerment	Manygro, Myto, Tusaidiane
Weather and climate information	MST

Table 5.2: Focus areas of local CCA institutions (Ochieng, 2013)

Local institutions can facilitate climate change adaptation by improving the social and economic capacity of the community, promoting interactions amongst themselves and with extra-local institutions and by providing learning spaces. The above findings support Agrawal’s (2008) view of local institutions being useful in facilitating adaptation to climate change at local level by among other things managing and implementing locally driven adaptation initiatives, creating opportunities for collective learning and by mediating interventions suitable to the local context.

5.2 Interaction of Extra-Local Institutions with Local Institutions

From the findings presented above, it is clear that a few extra-local institutions are involved in facilitating adaptive measures to climate change in Mathare 4B through their interactions with local institutions. Local public, civil and private institutions are the key in influencing climate change adaptation but a lot of their activities are influenced by their connection and interactions with institutions mandated from outside the community.

Data for this section was gathered from the 13 KII's carried out with representatives of local and extra-local institutions.

According to IPCC (2007), there are four scales at which climate change adaptation takes place; mega, macro, meso and micro. While mega adaptation measures are taken at global scale for example through international agreements, micro measures are at household level. Local institutions rely on external resources for the capacities they lack while on the other hand extra-local institutions rely on local institutions for their contextual knowledge and grassroots capacities to pursue their agendas.

According to Agrawal (2008), the need for extra-local institutions to interact with local institutions are situated in four main categories with the most important and obvious one being the provision of information about climate variability and change. Other external interventions include technical advances, financial and investment and leadership and institutional interventions. The areas of interventions that extra-local institutions are likely to focus on is dependent on whether they are public, private or civic. Agrawal (2008) further notes that public institutions are more likely to facilitate adaptation strategies around climate information and livelihood diversification while private institutions would more likely facilitate financial access and diversification. Civic institutions on the other hand are usually more dynamic because of their ability change their objectives and adopt new strategies. Information gathered from the key interviews showed that external intervention in Mathare 4B revolved around the areas suggested by Agrawal (2008) in what many of the interviewees referred to as capacity development. The areas of interaction are presented below.

5.2.1 Financial Support

As have been discussed throughout this study, access to financial support for poor urban residents is crucial to building adaptive capacity. In Mathare 4B extra-local institutions including the women trust fund and youth/women funds have promoted the creation of cooperatives and credit groups with objectives of economic empowerment. Many of these

cooperatives and groups are involved in activities that reduce the vulnerability of residents to weather-related hazards thus facilitating adaptation to climate change indirectly. The extra-local institutions have been able to increase access to cash economy also enabling mostly women and youth diversify their source of livelihoods.

For example, MST was able to access a loan from the government you fund and used it to buy wheelbarrows, hand-drawn carts, and cleaning implements that they use during weekly clean-up exercise around the community. These resources also double up as the inputs for their garbage collection business. Similarly, Tusaidiane and Manygro were able to access funds from the women and youth funds respectively to set up urban agriculture enterprises. The credit groups have also become a means of pooling risks and increasing economic efficiencies through collective action, strategies that greatly facilitates climate change adaptation.

5.2.2 Emergency Interventions

The Kenya Red Cross and the Meteorological Department reported to having early warning systems in Mathare 4B. Kenya Red Cross, collected information on weather from the Meteorological Department and then using MST disseminates this information to the residents and local authority. Kenya Red Cross was also the primary responder to hazards and disasters in Mathare 4B mainly providing emergency shelter and other relief items to be affected by these hazards.

5.2.2 Livelihood Diversification

Livelihood diversification seemed to be an important theme pursued by some of the extra-local actors. Solidarites France, Kenya Women Trust, MSF Belgium and the government all seemed to have programs geared towards the community diversifying their livelihoods. For example, Solidarites and the Ministry of agriculture focused mostly in local food production and were involved in activities to promote urban agriculture. They trained local women and youth groups on urban agriculture technologies and

provided inputs and other resources such as government land to pursue this strategy. Kenya Women Trust, Women and Youth funds provided trainings on small business start-ups and provided loans to some members in the community. Some of the diversification strategies such as urban agriculture dependent on rainfall could be questioned in terms of its long term effectiveness in adapting to climate change and variability although it was found to be effective in buffering against other stressors particularly during the rainy season.

5.3 Degree and Type of Access to Local Institutions

As discussed earlier in the literature review, institutional access and the interconnections of local institutions are crucial to climate change adaptation. Agrawal (2008) observes that institutional linkages are important because of how they affect resource flow between themselves and amongst households and community groups. Residents of Mathare 4B rely on knowledge and resources of these institutions in order to adapt to climate change but data collected showed that institutional access varied amongst households and social groups. Poor urban livelihoods call for the mobilization of different networks to gain access to labour, information and social support systems thus households and social groups' capacity to engage in climate change adaptation is shaped by the degree and type of access to the institutions.

Many of the respondents in discussions explained that households relied primarily on social capital in adapting to hazards. Their social networks included neighbours, friends and relatives who provided both financial and moral support and information regarding weather changes and emergency and relief programs.

According to the respondents, there were differences in the degree and types of access to local institutions amongst households and social groups. A key informant explained this as follows:

“You know, there is politics everywhere. In the self-help groups, church, NGO’s even in the local government. It depends on how rich you are, your tribe, who you

know or whether you are a member or not. And for many institutions not all members are equal”

The above sentiments seem to be in line with what Jones (2004) explained as the differences in availability and access to resources of local institutions amongst different segments of the society thus contributing to differential vulnerability. For example there was a clear difference in institutional access between households that were house owners (landlords) and those that rented. Landlords in most cases were also in leadership positions in the local institutions meaning that they were not only connected to the institutions but were very much involved in their day-to-day functioning and decision making. Their households, relatives and friends it was said, were prioritized in terms of access to resources. It was also clear that though from an outsider perspective, it is easy to regard all residents as poor in Mathare 4B, there were actually differentiation in terms of class, first as already pointed out between landlords and tenants but also depending on how long one had lived in the area and the type and location of one’s shelter.

Landlords, long-term residents and people that lived in the area for decades and those whose houses were structurally better (for example having corrugated walls rather than thatched mud or sitting on concrete foundations) had greater access to local institutions. This was quite obvious by observing the locations of the local institutions and their leadership. It was therefore clear that the degree and type of access that different households had to different institutions determined the benefits derived from them. Wealthier households derived greater benefits from the local institutions. This observation was made clearer by one young man that had lived in the area for less than five years, who said:

“People in the slums blame the government all the time for forgetting us. But here it is also the same. If you live in “mashimoni” (in the quarry pits) then it is very difficult to become a member of a self-help group or get help even from the church.”

From narrations of the respondents and also by observing the membership and target groups of many of the local institutions, it seemed that ethnic identities, gender and age also determined the access to the local institutions. Many of the cooperatives and CBO's were mainly made up entirely of women or youth (ages 18-30). In addition, it was discussed that many cooperatives only welcomed members of a single tribe. The activities of such institutions targeted their demographic membership and therefore women and youth had greater access to civic local institutions. Many of the public institutions were led by men and here men seemed have easier and greater access to them.

For example, many cooperatives and micro finance groups provide only funding to women or youth. Actually, during the discussions and interviews, there was no single civic institution that provided any type of financing to men above the age of 35. However, in terms of disaster relief for example or on land issues that was mainly in the domain of the local administration, men seemed to have a greater voice and as default, a household had to be represented by the man of the house in meeting and deliberations unless it was a female headed household. By mediating access to resources to specific demographics, the local institutions shape the way resources are distributed within the community and thus the options different people have in participating in climate change adaptation.

CHAPTER 6

6.0 CONCLUSIONS

First and foremost, the background study of Mathare 4B reveals a close link between marginalization, poverty and vulnerability. Residents in Mathare 4B are exposed to many everyday stressors as a result of their hazardous environment. With climate change, an already appalling situation is worsened as characterised by increase in the frequency and intensity of weather-related hazards. Due to their poverty and lack of adequate resources, responding and adapting to these hazards is very difficult thus the need of self-organization and external support.

Data from this study has shown that local institutions play an important role in climate change adaptation. They represent local capacities through Mathare 4B residents are able to determine for themselves how they manage the changes happening in the immediate environment. These local institutions not only facilitate important climate change adaptation by the activities they carry locally but they also produce the opportunities for interactions with extra-local institutions.

It has been clear that in Mathare 4B, the local institutions identified to play the most important roles in climate change adaptation are those that in principle practise 'self-help'. By organizing themselves through cooperatives, community based organizations or social groups, residents in Mathare 4B have been able to mobilize resources and gained capacities for determining the flow of information and adaptation activities that they wish to undertake,

Currently, poor people in cities do not have a strong presence in the global and national discourses around adaptation despite being crucial in any adaptive processes planned by governments and external actors in cities and specifically informal settlements of developing countries. For adaptation strategies to be successful at local levels and to avoid development programs that impacts negatively on the well-being of locals, external

interventions must gain a thorough understanding of the local political, social and economic dynamics. As this study has shown, a good way of doing this is by interacting and collaborating with local institutions.

While advocating for close collaboration and interaction with local institutions, the findings of this study has found that access to these institutions are not always equal and democratic. Extra-local institutions should sometimes challenge the management of these local institutions in acknowledging the marginalization of certain groups in the community and work towards a more equitable access of resources. The local institutions should also be challenged to find new way of cooperating by for example developing more public/private partnerships and common ventures between men and women to facilitate climate change adaptation.

From the findings of this study, it is therefore recommended that extra-local institutions have the opportunity of developing the adaptive capacities of poor people in urban settlements that do not necessarily rely on external interventions. This is important as it develops a base for future climate change adaptation activities. This would also develop the level of collaboration between local institutions and the extra-local ones.

REFERENCES

- Adger, W.N. (2000). Institutional adaptation to environmental risk under the transition in Vietnam. *Annals of the Association of American Geographers* 90 (4):738-758.
- Agrawal, A. (2008). The role of local institutions in adaptation to climate change. *International Forestry Research and Institutions Program (IFRI) Working Paper*.
- Berkes, F., Colding, J., & Folke, C. (Eds.), (2003). *Navigating Socioecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge, UK.
- Blaikie, P., Wisner, B., Cannon, T. and Davis, I. (2003). *At Risk: Natural Hazards, People's Vulnerability and Disasters*, London, Routledge.
- Burton, I. (1997). Vulnerability and adaptive responses in the context of climate and climate change. In *Climatic Change* 36: pp 185-196.
- Central Intelligence Agency (2012). "Kenya". The World Fact Book. www.cia.gov/library/publications/theWorldbook. Retrieved 28 February 2014.
- Commission on Climate Change and Development (CCD) (2009). Closing the gaps—disaster risk reduction and adaptation to climate change in developing countries, Stockholm. [http://www.ccdcommission.org/Filer/report/CCD_Report.pdf\(2009-05-31\)](http://www.ccdcommission.org/Filer/report/CCD_Report.pdf(2009-05-31)).
- Corburn, J., Ngau, P., Karanja, I., & Makau, J. (2012). *Mathare Zonal Plan: Nairobi, Kenya. Collaborative Plan for Informal Settlement Upgrading*
- Crane, T. A. (2013). The Role of Local Institutions in Adaptive Processes in Climate Variability. The Cases of Southern Ethiopia and Southern Mali.

Cross, R. and Parker, A. (2004). *The Hidden Power of Social Networks*. Harvard University Press.

Cross, R., Liedtka, J. and Weiss, L. (2005). *A Practical Guide to Social Networks*. Harvard Business Review.

Denscombe, M. (1998). *The good research guide for small-scale social research projects*, Buckingham: Open University Press

Eriksen, S. & Lind, J. (2009). Adaptation as a political process: adjusting to drought and conflict in Kenya's drylands. *Environmental Management*, 43 (5): 817-35.

Eriksen, S. H. & Marin, A. (2011). *Pastoral pathways: Climate change adaptation lessons from Ethiopia*. Oslo: Development Fund.

Gilgun, J. F. (2010). Reflexivity and Qualitative Research. *Current Issues in Qualitative Research*, 1(2).

GoK (2009). *Kenya 2009 Population and Housing Census Highlights*. Government of Kenya.

GoK (2008). *National Climate Change Response Strategy Executive Brief*. Government of Kenya.

Grothmann, T. & Patt, A. (2005). Adaptive capacity and human cognition: The process of individual adaptation to climate change. In *Global Environmental Change* 15, pp 199-213.

Haque, C. E. & Burton, I. (2005). Adaptation Options Strategies For Hazards And Vulnerability Mitigation: An International Perspective. *Mitigation and Adaptation Strategies for Global Change* 10: 335–353.

Huq, S. & Reid, H. (2007): Community-based adaptation: a vital approach to the threat climate change poses to the poor. International Institute for Environment and Development (IIED), London, UK.

Huq, S. & Reid, H., (2004). Mainstreaming adaptation in development. *IDS Bulletin*, 35(3), 15–21.

IFRC (2003). Preparedness for climate change: Implications for the International Federation of Red Cross and Red Crescent Societies. A study to assess the future impact of climatic changes upon the frequency and severity of disasters and the implications for humanitarian response and preparedness, IFRC, Geneva

IPCC (2007). *Climate Change 2007: Impacts, Adaptation and Vulnerability – Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.

Ireland, P. (2010) Climate change adaptation and disaster risk reduction: Contested spaces and emerging opportunities in development theory and practice. *Climate and Development* (2) 332–345.

Kelly, M. & Adger, N. (2000). Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptation. *Climatic Change* 47, pp 325-352.

Klein, R., Eriksen, S., Naess, L. O., Hammill, A., Tanner, T., Robledo, C. et al., (2007). Portfolio screening to support the mainstreaming of adaptation to climate change into development assistance. *Climatic Change*, 84. 23–44.

Leary, N., Adejuwon, J., Bailey, W., Barros, V., Batima, P. & Caffera, R. M., (2008). For whom the bell tolls: vulnerabilities in a changing climate. *Climate Change and*

Vulnerability, N. Leary, C. Conde, J. Kulkarni and A. Nyong and J. Pulhin (eds). Earthscan, London.

Lwasa S, Mabiriizi F et al.: Assessment of Urban Vulnerabilities to Climate Change in Uganda. Nairobi: United Human Settlements Programme; 2009. 67.

Mehotra, S., C. E. Natenzon, A. Omojola, *et al.* (2009). *Framework for City Climate Risk Assessment*. Commissioned research, World Bank Fifth Urban Research Symposium, Marseille, France.

Moser, C., Norton, A., Stein, A. & Georgieva, S. (2010). “Pro-Poor Adaptation to Climate Change in Urban Centers: Case Studies of Vulnerability and Resilience in Kenya and Nicaragua” Social Development Department, World Bank, Washington DC

Moser, C. & Stein, A. (2010). “Implementing Urban Participatory Climate Change Adaptation Appraisals: A Methodological Guideline” Global Urban Research Center, Manchester, UK

Naess, L. O., G. Bang, S. Eriksen, & J. Vevatne. 2005. Institutional adaptation to climate change: Flood responses at the municipal level in Norway. *Global Environmental Change* 15: 125-38.

North, D.C., 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge University Press, Cambridge.

O’Brien, K., Sygna, L., Leichenko, R., Adger, N., Barnett, J., Mitchell, T. et al. (2008). *Disaster Risk Reduction, Climate Change Adaptation and Human Security*. The Global Environmental Change and Human Security Project (GECHS), Oslo.

O’Brien, G., O’Keefe, P., Rose J., and Wisner B. (2006). Climate change and disaster management. *Disasters*, 2006, 30(1): 64–80. Overseas Development Institute.

Pelling, M. et al. (2003). *Natural Disasters and Development in a Globalizing World*. Routledge, London

Rubin, H.J & Rubin, I.S. 2005. *Qualitative Interviewing. The Art of Hearing Data*. Sage Publications, Inc. California.

Satterthwaite, D., Huq, S., Pelling, M., Reid, H., and Romero-Lankao, P. (2007). *Adapting to Climate Change in Urban Areas: The Possibilities and Constraints in Low- and Middle- income Nations*. International Institute for Environment and Development, London.

Schipper, L., 2009. Meeting at the crossroads?: investigating the linkages between climate change adaptation and disaster risk reduction. *Climate and Development*, 1. 16–30.

Schipper, L. and Pelling, M. (2006): Disaster risk, climate change and international development: scope for, and challenges to, integration. *Disasters*, 30(1). 19–38.

Shenton, A. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information* 22 63–75 63. IOS Press

Smit, B. and Wandel, J., 2006. Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, 16. 282–292.

Twigg, J., 2007. *Character of a Disaster-resilient Community: A Guidance Note*. DFID, London.

UN/ISDR, 2008a. *Climate Change and Disaster Risk Reduction*. United Nations, Geneva.

UN/ISDR, 2008b. Disaster risk reduction strategies and risk management practices: critical elements for adaptation to climate change. Submission to the UNFCCC Adhoc Working Group on Long Term Cooperative Action. UN/ISDR.

UN Habitat 2008: The State of African Cities 2008: A framework for addressing urban challenges in Africa.

UNFCC (2008). Disaster Risk Reduction Strategies and Risk Management Practices: Critical Elements for Adaptation to Climate Change Submission to the UNFCCC Adhoc Working Group on Long Term Cooperative Action by The Informal Taskforce on climate change of the Inter-Agency Standing Committee¹ and The International Strategy for Disaster Reduction 11 November 2008. United Nations, Geneva.

Uphoff, N. 1986. *Local Institutional Development: An Analytical Sourcebook, with Cases*. Kumarian Press, West Hartford, CN.

Winchester, H. P. M. & Rofo, M. W. (2010). Qualitative Research and Its Place in Human Geography. In *Qualitative Research Methods in Human Geography*, pp. 3-25. Oxford: Oxford University Press.

Wisner, B. et al. (2004). *At Risk: Natural Hazards, people's vulnerability and disasters*. Routledge, London.

APPENDICES

APPENDIX I: Definition of Terms

Access

Refers to the extent to which different social groups and households within a certain area have connections to local institutions including having the ability to benefit from assets and resources of these institutions as a consequence of their connections (Agrawal, 2008).

Adaptive Capacity

The term adaptive capacity according to Nelson et al. (2007: 397) refers to “preconditions that enable actions and adjustments in response to current and future external changes; dependent both on social and biophysical elements”.

Climate Change Adaptation

IPCC (2007) defines adaptation to climate change as the ‘adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities’.

Disaster Risk Reduction

The United Nations International Strategy for Disaster Risk Reduction (UN/ISDR) has defined DRR as ‘action taken to reduce the risk of disasters and the adverse impacts of natural hazards, through systematic efforts to analyze and manage the causes of disasters, including through avoidance of hazards, reduced social and economic vulnerability to hazards, and improved preparedness for adverse events and impacts and the formulation of local adaptation activities’ (UN/ISDR, 2008b)

Extra-Local Institutions

Refers to public, civil and private organizations and individuals whose accountability and legitimacy is derived beyond the scope of the communities within which they normally operate in (Agrawal, 2008).

Informal Settlement

Informal settlement is a term that is often used synonymously with slum. For this study, informal settlement is used in accordance to the UN Habitat (2008) definition that refers to it as a contiguous settlement characterized by inadequate housing and basic services for residents and often neither recognized nor attended to by public authorities as an important or equal part of the city. UN Habitat (2008) describes inhabitants of informal settlements as often lacking one or more of access to safe water, adequate sanitation, durable housing, secure tenure and adequate living space.

Livelihood

Livelihoods are commonly defined as “the capabilities, assets (stores, resources, claims and access) and activities required for a means of living” (Chambers & Conway 1992: 7). A livelihood is hence a way of earning a living. Formal employment comprises one form of livelihood, but it is not the only one. As emphasized by Chambers (1995), poor people normally rely on a variety of livelihoods, which are based on multiple activities and sources of food and income.

Local-Institutions

According to Uphoff (1986), decision making and implementation of actions occur in any of ten levels, starting at top in the international sphere down to individual level. In this

study, the use of the term local is restricted to within the community level referred to as fairly self-contained socio-economic residential unit. Institution is a widely used term that from the review of literature, seem to be open to several subjective meanings. Ostrom (1992) defines the term institution as rules in use by a set of individuals to organize recurring activities that lead to results affecting them and maybe others as well. According to North (1990), institutions are “*rules of the game*” and are divided into two categories made up of formal (constitutions, laws and property rights) and informal (sanctions, taboos, traditions and codes of conduct). However, the term has also been used to refer to political, economic and social organizations/entities such as local governments, user associations, service organizations etc.

For the purpose of this study, local institutions refer to formal and informal organizations, social groups and individuals mainly with accountability and legitimacy established within the communities in which they operate in. These are classified into three broad categories including public (bureaucratic administrative units, and elected local governments), civic (individuals, households, membership and cooperative organizations) and market (service and business organizations) (Agrawal, 2008).

Resilience

Resilience refers to the quantity of variation a system can endure and still maintain the same function and structure while keeping alternatives to develop in preferred directions (Berkes et al. 2003)

Vulnerability

The climate change vulnerability literature increasingly understands vulnerability as driven by multiple stressors, that is, people are vulnerable to climate change due to a range of other environmental and social changes facing them at the same time (O’Brien and Leichenko, 2000; Reid and Vogel, 2006). Vulnerability is seen as the contextual

conditions of social and ecological systems that contribute to negative outcomes from interacting changes (O'Brien et al. 2007).



Norwegian University
of Life Sciences

Postboks 5003
NO-1432 Ås, Norway
+47 67 23 00 00
www.nmbu.no