SOCIAL CAPITAL FOR ADAPTATION TO CLIMATE CHANGE IN THE MARA RIVER BASIN, KENYA

BY

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DECLARATION

DECLARATION BY THE CANDIDATE

This thesis is my original work and has not been presented for a degree or any other award in any other University.

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DEDICATION

For my darling daughter, coz you burn with the brightest flame.

ABSTRACT

The social context within which climate change is experienced can determine the ease of adapting to the crisis. This has brought to fore the potential that social capital holds in building the adaptive capacity of communities. The designated study area was the Mara River Basin, a trans boundary basin and a major contributor to the East African Economy. The river basin has reported evidence of negative impacts of climate change. The study was inspired by the realization that current empirical studies in the Mara River basin have focused on the ecological aspects of climate change and overlooked the human aspects and how the affected populations are utilizing social capital to adapt to this crisis. Further, the study acknowledged that most of the adaptation strategies accounted for in academic discourse are reported from the perspective of developed countries. The study is significant because it draws attention to how social networks may dictate the pace and direction of adaptation to climate change. The study also contributes to literature on social aspects of climate change within the context of a developing country. The study objectives were to; explore the dimensions of social capital found within the basin; establish the role of social capital in facilitating community understanding of climate change; and explore the ways in which social capital contributed towards strategies for adaptation to climate change along the Mara River Basin. Social capital theory attributed to Bourdieu (1986), Coleman (1988) and Putnam (1993), was used to explain the different concepts of the study. The study used cross sectional descriptive design. Yamane's (1967) formula was used to sample 400 adults to whom questionnaires were administered for quantitative data collection. Qualitative data was collected from 24 participants of FGDs and 12 purposively sampled key informants. Quantitative data was cleaned, coded, entered and analyzed in SPSS 21.0 to generate means and frequencies. A content analysis was done for the qualitative data, which was then arranged into thematic areas guided by the study objectives. The findings indicated that the study area was endowed with both structural and cognitive social capital embedded within the existing social structures and organizations. Social capital contributed to the residents understanding of the climate change crisis by easing information flow between the actors within networks. Social capital further contributed to climate change adaptation efforts by reducing financial, physical and psychological costs of implementation of adaptation activities. The study concluded that the presence of social capital was significant for the functioning of the study area because it influenced information flow and fostered collective action towards addressing climate change. The study recommends that policy makers and climate change stakeholders should strengthen the existing social capital to enhance the communities' adaptive capacity in responding to climate change. There is also need take into account local understandings of the climate crisis to establish existing gaps and allow for context specific climate planning. Finally, there is need to appreciate the role played by social capital in reducing adaptation costs and incorporate it into formal discussion aimed at developing strategies against the climate crisis.

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LIST OF ABBREVIATIONS

ARCAB	Action Research on CBA in Bangladesh
CBA	Community Based Adaptation
CMG	Catchment Management Groups
EMCA	Environmental Management and Coordination Act
FEWS-NET	Famine Early Warning Systems Network
GoK	Government of Kenya
GTZ	German Technical Cooperation Agency
LVBC	Lake Victoria Basin Commission
LVBWB	Lake Victoria Basin Water Board
LVBWO	Lake Victoria Basin Water Office
MRBMI	Mara River Basin Management Initiative
MRCC	Mara River Catchment Committee
MRWUA	Mara River Water Users Association
NGO	Non-Governmental Organization
NEMA	National Environmental Management Authority
NORAD	Norwegian Agency for Development Cooperation
OECD	Organisation for Economic Co-operation and Development
PRA	Participatory Rapid Appraisal
TWRUF	Trans-boundary Water Resources Users' Forum
UN	United Nations
USAID	United States Agency for International Development
WRMA	Water Resources Management Authority
WUA	Water Users Association
WWF	World Wide Fund for Nature
WWF/ESARPO	World Wide Fund for Nature Eastern Southern African Regional Programme
WWF-KCO	World Wide Fund for Nature- Kenya Country Office
WWF-TCO	World Wide Fund for Nature- Tanzania Country Office

CHAPTER 1: INTRODUCTION

This chapter gives a brief background of social capital, climate change and the opportunities that the presence of social capital presents for adapting to the climate change crisis. The section also provides the problem in relation to the study area; the research questions and objectives that the study sought to address; the significance of the study, its scope and some of the limitations experienced during the period of study. It finally presents the theoretical framework, which illustrates how social capital theory provides a basis for the study.

1.1 Background to the Study

Social capital has gained popularity over recent years and has become an integral part of policy making processes (Pelling, 1999). As such, social capital has been defined variously by different scholars all highlighting the significance of social relations (Bourdieu, 1986; Coleman, 1988; Putnam, 1993; Fukuyama, 1999; Portes, 1998). This study adopts a definition that encompasses tenets posited by most of these scholars, which describes social capital as relations of trust, reciprocity, and exchange; and the role of networks (Adger, 2003). Grooteart, and Bastelaer (2001) state that what makes social capital more than just a set of social organizations or social values is that it requires an investment as an input to ensure its longevity, while at the same time it results in numerous kinds of benefits. This, he argues, is what makes it genuine capital.

According to Woolcock (2001), bonding social capital denotes homogeneous ties between people in similar situations, such as immediate family, close friends and neighbors while bridging social capital encompasses heterogeneous ties of like persons, such as loose friendships and workmates. According to Woolcock and Sweetser (2002), bridging social capital points to connections between or amongst people who are dissimilar in some

demographic sense while according to Field (2003), it tends to bring together people across assorted social categories. Linking social capital on the other hand reaches out to unlike people in dissimilar situations, such as those who are entirely outside of the community, thus enabling members to leverage a far wider range of resources than are available in the community (Woolcock, 2001). Pelling, (1999) argues that social capital has gradually gained recognition in a wide range of social policy. He cites the fields of economic development, health, education, regeneration, community development and social exclusion and poverty alleviation, as those that have embraced the movement of social capital from a theoretical concept to the richness of formal social organization in society that leads to collective action.

The United Nations Framework Convention on Climate Change (UNFCCC) (2015) defines climate change as a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is, in addition to natural climate variability observed over comparable time periods. Archer and Rahmstorf (2010), argue that climate change did not come about suddenly but is a process that is attributed to rapid urbanization and the pressure it exerts on the environment. According to the United States Global Change Research Program (2009), climate change is a problem because it could threaten natural resources that support local economies, as well as the goods and services they produce and the jobs and livelihoods of those who depend upon them, such as, farming communities, tourism and recreation industry. It is therefore apparent that management of ecological resources is key for successful adaptation to climate change to occur. According to McCarthy, Canziani, Leary, Dokken, and White, (2001), adaptation requires that adjustments are made in natural or human systems to ensure survival and to respond to already experienced and anticipated climate effects. In essence, adaptation describes the natural or deliberate alteration activities in an attempt to survive the climate crisis. Further arguments by

Pelling (1999) contend that climate change is a risk to developmental endeavors and therefore requires that social processes involved in decision-making in responding to the crisis are understood. To this end, he argues that social capital can highlight important issues in the nature and formation of social organization, through the interaction of social structures and agency.

Several arguments postulated on the potential of social capital could make it beneficial to the process of adapting to climate change. Dietz, Ostrom, and Stern (2003), highlight that the context within which climate change is experienced can make it easier or more difficult to develop an arrangement that allows humans to adapt successfully. They further argue that the effective governance of resources is easier to achieve when frequent communication and dense social networks characterize communities. These characteristics increase the potential for trust and lower the cost of monitoring resource users' behavior and enforcing rules.

Ishihara and Pascual (2013) state that, social capital contributes to the creation of common knowledge, which upon being shared amongst community members may successfully lead to collective action towards the solution of environmental type problems. Melé's (2003) interpretation of social capital highlights it as being beneficial to the entire society by reducing transaction costs and facilitating the exchange of resources and information between individuals thereby enhancing their capacity to come up with solutions and to learn. This generally means that where social capital is high, people are more informed and therefore tend to invest more in collective activities, especially regarding management of common resources because their costs (financial and physical), for doing so are reduced. Fukuyama (2001) posits that social capital (potential or dormant) can be harnessed in the light of climate crisis to reduce collective risk. This implies that social capital can increase community

resilience in the face of the risks posed by climate change. Rayner and Malone (2001) argue that the diversity of interpersonal ties that are a part of social networks provide a fundamental resource that can foster individual and collective adaptation in the face of climate change. Pelling (1999) argues that looking at climate change through the social capital lens allows for research to provide clarity to the different social contexts within which the climate crisis is experienced and how societies organize themselves to approach these changes. This provides the opportunity to focus climate change research on specific context and hence facilitating the generation of local solutions.

The role of social capital in enhancing communities' adaptive capacity is further strengthened by empirical evidence. Gentle, Thwaites, Race, and Alexander (2013), indicate that social capital generated through membership in local institutions enabled community members in Nepal to leverage resources that reduced collective vulnerability and enhanced their adaptive capacity. Adger (2003) provides an insight into how synergistic ties between the government and local stakeholders in Trinidad and Tobago improved the management of the marine park. In the same literature, he provides more evidence of management of coastal dykes by community members in the absence of government support and frameworks.

The opportunities presented by this data point to the potential contribution social capital can make in addressing the informality and multiplicity that enables social relationships shape research and policy on adaptation to climate change at micro level. This is especially so for Africa where climate change does not feature substantively in policy agendas due to competition from existing developmental challenges such as endemic poverty, complex governance and institutional dimensions, limited access to capital, including markets, infrastructure and technology; ecosystem degradation; complex disasters and conflict

(Houghton, 2009). All these issues, in addition to competing with climate change on the policy platforms, further reduce Africa's adaptive capacity to the climate crisis. Yet, it is critical to note that the effects of the changes in climatic conditions continue to be experienced in several sectors within the continent including: agriculture; energy; water; health; plant, animal and ecosystems; forests; and recreation. Adaptation therefore becomes a crucial factor that will shape the future severity of climate change effects on different sectors of people's livelihoods.

To date 21 global forums have been held by the United Nations Framework Convention on Climate Change to discuss the state of global climate crisis and possible ways forward (UNFCCC, 2015). Adger, (2003) argues that the dominant discourses in these international negotiations are not reflective of the current realities since they view adaptation as a process that can be made easier through international development transfers. He suggests that there is need for the realignment of policies to focus not only on reducing emissions but also on supporting the inherent resilience of vulnerable communities. Further arguments by Adger, and Barnett (2009), advance that opportunities and constraints or limits to adaptation are ingrained in society itself and determine the success or failure of adaptation initiatives.

Observed and projected effects of climate change in Kenya include increased desertification, species loss, receding rangelands, increase in sea levels, changes in precipitation and surface runoff leading to changes in availability of water, disease outbreaks, temperature rises, intensified human-wildlife conflict, population displacement, destruction of public utilities and private property, and reduced hydropower generation (Kenya National Climate Change Response Strategy, 2010). These effects are expected to have profound impacts on communities' livelihoods and the nation's economy as a whole. Thus the question of the role

social capital would play to enhance the community's capacity in the fight against climate change. However, evidence to this effect is inadequate.

There is reported evidence of negative effects of climate change in the Mara River Basin as well, a trans-boundary basin straddling both Kenya and Tanzania. This basin is a major contributor to the economy of the East African region because it supports the livelihoods of different communities that depend on it for survival. The basin also sustains a thriving tourism industry built around wildlife within the National Reserves (Dessu & Melesse, 2013). The significance of this river basin to several communities and ecosystems therefore makes adaptation to climate change exigent. The climatic changes in this river basin have manifested in changes in water resources, which result from changes in precipitation and runoff, poor water quality aggravated by environmental degradation. Other anthropogenic drivers of climate change include loss of native forest cover in the upper parts of the catchment and along rivers, unsustainable agricultural expansion and intensification, human population growth, poorly planned tourist facilities, and water pollution and abstractions by industries and urban settlements; all which have exacerbated the situation and continued to affect community livelihoods (Global Water for Sustainability, 2012).

However, the potential influence of social capital in enhancing adaptation to climate change in this area is not clear. The existing studies on climate change within the river basin tend to focus statistical tests to establish changes in the state of climate. For instance, Mwangia, Julicha, Patlib, McDonald, and Fegera (2015), using statistical tests, study the contribution of climate variability on the discharge of the upper Mara River within the basin. Dessu, and Melesse (2013), provide a comparison of rainfall estimates from different satellites within the basin. Mango, Melesse, McClain, Gann, and Setegn (2010), using a Soil and Water

Assessment Tool (SWAT), explore the climate change impacts on the hydrology of the upper part of the Mara River Basin.

All these studies do not focus on the human aspect of climate change. They fail to show how these changes affect the populations living in the area and additionally how the residents of the basin organize themselves to approach the observed and anticipated climatic changes. At the same time, the studies cited earlier elaborating the potential of social capital in addressing climate change in other areas could not be used to conclusively describe the Mara River Basin situation because the contexts are quite different. For, instance, a study by Kithiia (2010) done at the Coast of Kenya explores aims at highlighting the potential that social capital holds in relation to responding to the climate crisis in the Kenyan context. However, the study concluded that the activities carried out to preserve mangroves along the coast were without any regard to climate change adaptation. Additionally, the study deals with a different community that has different norms and value systems from those of the communities inhabiting the Mara River Basin. Further, climate change impacts experienced in Mombasa are incomparable with the main issue of concern at the coast being the rise in seal level and its ramifications.

As posited by Adger (2003), and Pelling (1999), climate change impacts and strategies for adaptation tend to be space-bound. That is, perceptions of climate change effects and how people choose to respond tend to portray specific characteristics of people's ways of life that can only be identified through culture and place specific research. Further, Keane (1998), points out that social capital tends to focus on uniqueness of place or context and therefore presents an opportunity for the generation of local solutions. Finally, according to Folke

(2002), different kinds of networks will settle on different kinds of strategies for adaptation. Hence what works in one place may not work in another.

Therefore, guided by these arguments, the study sought to investigate how the Mara River Basin community was organized in terms of the dimensions of social capital that were in existence, how these networks then contributed to enabling residents understand climate change and if the presence of social capital contributed in any other way to climate change adaptation within the study area.

1.2 Statement of the Problem

The contribution of social capital in shaping the Mara River Basin community's adaptive capacity is not evident. Existing literature on climate change within the river basin focuses mainly on the ecological aspects of the crisis, which mainly explore the climate crisis in terms of statistical changes in various indicators like precipitation, hydrology and temperature. Adaptation to the climate crisis is critical to securing livelihoods and conserving resources for future generations. However, how networks that exist between community members can be exploited to enhance resilience and reduce magnitude of climate change especially in the Kenyan context and more specifically within the Mara River Basin is not clear. Knowledge on the strength of networks in addressing the climate change problem appears to be inadequately acknowledged especially by policy advisors, makers and is inadequately accounted for in formal processes. There have been several forums and conferences focusing on developing national, regional and even global policies and agreements on climate change as a way of mitigating further devastation. The focus of these conferences has thus far been at the macro-level, with nation states striving to sign agreements with each other. Most of these agreements might take little or no account of the local strengths, weaknesses and needs since

they are driven by emerging market opportunities and not necessarily by the need to improve the adaptation capacities of those already experiencing the effects of climate change.

1.3 Research Questions

The study sought to answer the following research questions:

1. What dimensions of social capital exist within the Mara River Basin?
2. What role does social capital play in facilitating the Mara River Basin community's understanding of climate change?
3. In what ways does social capital contribute towards climate change adaptation initiatives along the Mara River Basin?

1.4 Study Objectives

The main objective of this study was to explore how social capital instigates actions towards climate change adaptation within the Mara River Basin.

The specific objectives were to:

1. Explore the different dimensions of social capital that exist within the Mara River Basin.
2. Establish the role of social capital in facilitating community understanding of climate change in the Mara River Basin.
3. Explore the ways in which social capital contributed towards climate change adaptation initiatives along the Mara River Basin.

1.5 Significance of Study

At this crucial point in history when Kenya and indeed the whole of East Africa cogitates which direction to take with regard to climate change policies, it is critical that each of the member countries does a proper vulnerability and capacity assessment in order to ensure that any policy developed in the area of climate change reflects the realities on the ground. This research is therefore significant because it explores the potential that social capital holds in shaping communities' adaptive capacity to future climate change. It draws attention to the informality that surrounds the utilization of relationships in community based adaptation processes. The research further provides evidence that might be critical in supporting the inclusion of social capital in formal discussions about climate change in a bid to integrate social and ecological responses to the crisis.

Looking at climate change through a social capital lens improves the understanding of how social networks within a social system may dictate the direction and rate of adaptation to experienced and anticipated climatic changes. In other words, what kinds of ties (bonding, bridging or linking), are most effective for specific contexts and why, or if there is need to balance all three. Since literature alludes to the preference for generation of local solutions and responses towards the climate crisis, this ethnographic research highlights the specificities surrounding the notions context and how societies organize themselves to approach climate change. That is, how people form networks and what they utilize said networks for in the face of climate change.

This study therefore sought to deepen policy advisors' and policy makers' and communities' appreciation on the potential that exists within social networks, and how this potential can be put to use in developing strategies and facilitate action towards addressing climate change by

contributing to adaptation mechanisms and strategies. Additionally, the study intends to make a complementary contribution to the growing body of knowledge on pertinent issues within the climate change arena with special emphasis on the Kenyan context.

1.6 Scope and Limitations of the Study

The study was only carried out in the selected clusters on the Kenyan side of the Mara River Basin. Therefore generalizations from the study findings should be made with caution and taking into account the local context. The study also mainly focused on adaptation efforts at the micro levels, that is individual, household and group levels, albeit the findings may be useful to policy advisors and makers involved in the development of policies for climate change at the national and regional levels.

The study included questions that relied on the memory of the respondents in that, they were expected to look backwards and examine the trends of certain issues relating to climate change within the study area. This might have presented a recall bias. To minimize this bias, the study employed complementary data collection methods, that is, FGDs and questionnaire survey.

1.7 Theoretical Framework

This study considered the postulates of Social Capital Theory to guide the research. The theory provided a basis for the organization of facts and further facilitated the revelation of gaps within the existing knowledge.

Social Capital Theory is attributed to Bourdieu (1986), Coleman (1988) and Putnam (1993). These three scholars have slightly differing positions with regard to social capital and its role in community. Bourdieu (1986), refers to social capital as “the aggregate of the actual or

potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition - or in other words, to membership in a group - which provides each of its members with the backing of the collectively-owned capital, a 'credential' which entitles them to credit, in the various senses of the word" (p. 248). For Bourdieu, Social capital is associated with the size of network and the quantity of past social capital accumulated and commanded by the actor. He further argues that actors posses certain inequalities that might be economic, cultural, social or symbolic that predispose or condition them to activate their social capital differentially in the competition for the appropriation of available scarce resources.

For Coleman (1988), social capital 'consists of some aspect of social structure, and facilitates certain actions of actors- whether persons or corporate actors-within the structure' (p.98). Coleman argues that social capital is defined by its function in that it is used so that actors can achieve particular ends that would have been impossible without it (Coleman 1990). He furthers this argument with the position that what sets social capital apart from both financial and human capital, is that it essentially resides in institutionalized relationships among people.

For Putnam (1993), social capital refers to 'features of social organizations, such as networks, norms and trust that facilitate action and cooperation for mutual benefit' (p.35). Putnam believes that social capital is a quality that can be a facilitator of interpersonal cooperation. He argues that 'working together is easier in a community blessed with a substantial stock of human capital' (p.35-6). According to Putnam (2000), social capital has a collective value where members of a social network are inclined to do things for each other. Summarized as

bonding ties (homogeneous or exclusive ties), bridging ties (distant or inclusive ties) and linking ties those holding vertical hierarchies together (Putnam, 2000; Woolcock, 2001).

Despite their slightly differing positions, these three scholars have a point of convergence, where social capital consists of some aspect of social structure, and it facilitates or regulates actions of individuals who are within said structure. This is either as a result of their interactions within the networks or norms of trust and reciprocity that result from said relationships.

Social capital theory clarifies this study by exploring how two dimensions of social capital namely structural and cognitive contribute to the processes of adaptation to the climate change crisis within the Mara River Basin. Structural social capital is a relatively objective and externally observable construct, which is embedded in established roles, social networks and other social structures supplemented by rules, procedures, and precedents. Cognitive social capital on the other hand is a more subjective and intangible concept that refers to shared norms, values, trust, attitudes, and beliefs (Uphoff & Wijayaratna, 2000). As such the study sought to establish if social capital in these dimensions facilitated information sharing, collective action and decision-making with regard to climate change adaptation in the designated study area.

Social capital theory further illuminated the study by proving a basis for exploring how structural and cognitive social capital resulted in immanent relationships within the community at bonding, bridging and linking levels. The study further explored how these relationships provided useful support when needed, the mutual exchanges that arose among actors and how actors maximized the utility of said relationships by sensibly choosing the best options available to them in tackling climate change. Furthermore, the study sought to

identify if there were any social relations, like trust based relations that were established and if there were any acts of exchange and transfer of information about climate change resulting from these interactions. The study considered how like physical and human capital, social contacts influenced the productivity of individuals and groups and as a result enhanced their adaptive capacity. It also sought to find out if the strategies for adaptation to climate change at the community level largely involved informal agreements amongst individuals and groups within the said communities. The study sought to ascertain if these agreements and activities carried out as a consequence were made easier by the existence of social capital, in other words, the study sought to establish if social capital through collective action reduced the cost of adapting to the climate crisis, thereby signifying how social capital contributed to climate change adaptation within the river basin.

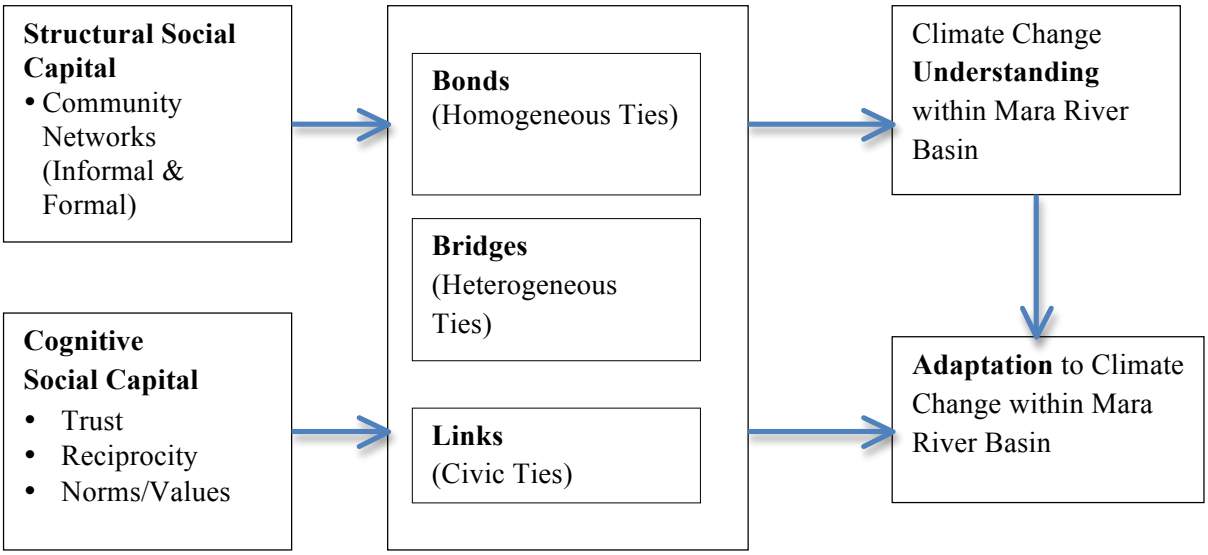

Figure 1: Operationalization of Theory. Source Researcher

However, the proponents of this theory have been criticized for neglecting the negative effects of social capital. Social Capital Theory does not point out that the closure of networks can have negative externalities, in the first place for the outsiders that cannot benefit from the

resources of the network and secondly, for the members of the network itself that cannot gather new information from outside the network (Portes 1998; Portes & Sensenbrenner, 1993). Also, there are problems in the concepts that make formalization of social capital difficult. Coleman for instance considers social capital in a functionalist light. This functionalist view of social capital may be a tautology, because social capital is identified only when it works (Lin, 1999). The study sought to establish if this 'dark side' of social capital was reflected in the study area and if it was in any way detrimental to the gains that may have been presented by social capital with regard to improving the adaptive capacity of the study population.

CHAPTER 2: LITERATURE REVIEW

The literature review gives an insight into the topical issues as itemized in the study objectives. It strives to give an understanding of what social capital is, its role in shaping community understanding of climate change and finally it brings out the link between social capital and climate change adaptation. The literature review also presents the gaps in each section that contribute to the significance of the study.

2.1 Dimensions of Social Capital

Numerous attempts have been made to define social capital by coalescing ideas by different scholars. Most of these definitions have stressed on social capital facilitating access of resources or prompting cooperation through social expectations embedded in relations, networks, norms or trust (Castell, 2010). According to Coleman (1990), social capital is entrenched in different units in society, which consist of some aspect of social structure, and its main function is that it facilitates certain actions of individuals who are within the structure. Putnam (2000), posits that social capital differs from human and physical capital in that, whereas physical capital refers to physical objects and human capital refers to the properties of individuals, social capital refers to connections amongst individuals- social networks and the norms of reciprocity and trustworthiness that arise from them. An attempt at making social capital easier to understand presents two key dimensions: its scope (micro, meso, and macro) and its forms (cognitive and structural). By delineating social capital in this way, it becomes clearer exactly how it is an asset at different levels and how investments can be made to strengthen it further (Grootaert & Bastelaer, 2001).

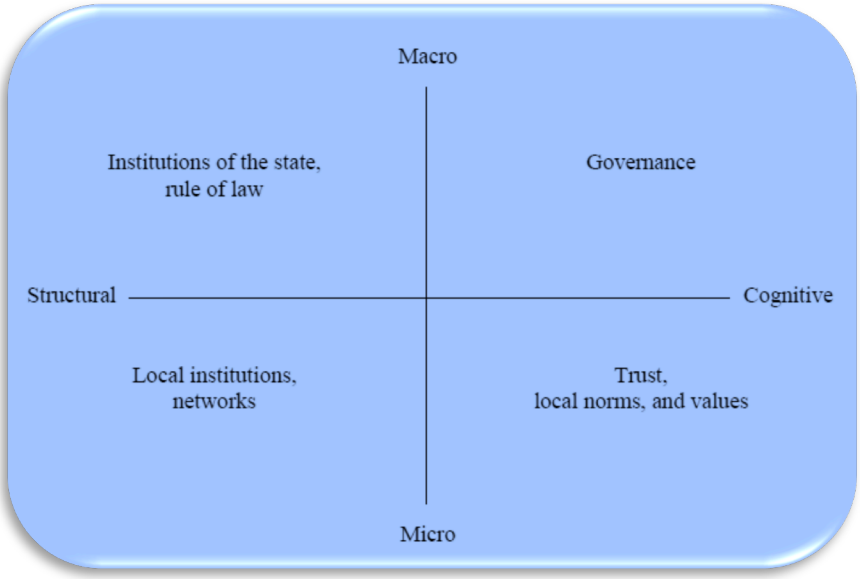

Figure 2: Dimensions of Social Capital. Source Grootaert and Bastelaer (2001)

Whether at the household, institution, societal or global level, social capital has been analyzed as having an influence on developmental issues as a result of the connections between two distinct forms of social capital—structural and cognitive. These forms of social capital give rise to different types of social capital that actors can relate with at their different levels and draw from to achieve their different objectives.

Woolcock (2001) gives a description of these three types of social capital based on the kinds of ties they encompass and the function they serve. Bonding social capital tends to be restricted and denotes ties between people in similar situations, such as immediate family, close friends and neighbors. As such it has a tendency to be more inward looking and additionally reinforce exclusive identities and homogeneous groups. Bridging social capital is inclined towards encompassing people across different social divides, in other words, more distant ties of like persons, such as loose friendships and workmates. Linking social capital on the other hand encapsulates vertical ties, which are valuable because they enable communities

to access resources from formal institutions outside the community. These explanations of social capital at different levels, in its different forms and types, provide an explanation of how individuals can use their relationships to other actors in societies for their own and for the collective good. This collective good, or welfare, has both material elements and wider non-physical and social dimensions. Brehm and Rahn (1997), view it as a web of cooperative relationships between actors in society that enhance their capacity towards resolution of collective problems. For Lin (2001), social capital signifies access to social resources for actors in society. These definitions of social capital whether focusing on functionality or causality, capture the gist of social relations and it's explanations for certain outcomes in society.

Winter (2000), argues that for social capital to influence public policy, it's critical to establish, measure and describe, what communities rich in social capital communities look like. Further, the role that social capital plays within them can also provide pointers on how policy can invest in enabling the growth of such communities. Thus, without taking stock of a society's social capital base, the potential that lies in its attractive characteristics would remain unspecified (Falk & Harrison, 1998). This has given rise to the debate surrounding the measurement of social capital. According to Fukuyama (2001), one of the major weaknesses of social capital is the absence of standard indicators of measurement, which provides avenues for critique. This difficulty in reaching a consensus in indicators of measure has been attributed to the diversity in the definition of the concept of social capital. Durlauf (2002) argues that the mix of functional and causal characteristics in defining social capital accounts for the differences in empirical results. This means that depending on their interests, scholars may focus on the operations aspects of social capital or the contributory ones. Paxton (1999) further argues that previous empirical studies on social capital have focused on single variable

measurements to determine the existence or strength of social capital. This arguments mirror Cox and Caldwell's (2000) position that the multi-dimensional nature of social capital calls for an array of indicators to ensure the effectiveness of any measurement.

The conventional measurements of social capital have focused on one, mapping out the physical structure in terms of its size, density, openness, homogeneity and density; and two, the cognitive or normative aspect which looks at issues of trust, unity and reciprocity in both formal and informal networks (Stone, 2001). The study in the Mara River Basin embraced a similar direction by seeking to establish the structural and cognitive dimensions of social capital within the study area.

In this section, the research reviewed three existing works that make contributions to empirical research on social capital in Kenya. The purpose for this was to establish what indicators the studies used to measure social capital within the areas of study and how these supported the empirical results arrived at.

Nyangena and Sterner (2008) conducted a comparative study of Meru, Kiambu and Machakos districts of Kenya. All the selected study sites were densely populated and thrived in agriculture. They sought to establish the dimensions of social capital in the districts and if this had a role to play in the revival of Machakos from its 1950's position of overpopulation and environmental degradation. The study defined its indicators of measuring social capital as membership in associations, the existence of trust, cooperation with neighbors and flow of information. Their results show that with regard to the indicators of trust and information, the results were similar in all the study sites. When it came to cooperation with neighbors, the difference was only significant when Machakos was compared to Meru but not to Kiambu, because for this variable Machakos had the lowest value unlike Meru which scored highest.

Their study results also exhibited that Machakos differed from the other study areas when it came to association membership and diversity. They attributed this to historical and cultural dispositions and drew that conclusion that this aspect of social capital contributed to economic development in Machakos. They present the argument that these associations acted as a library of information and therefore enabled community members to connect the past (that was marred by environmental degradation) and the present (modern agricultural techniques). They further argue that by working together in the associations farmers were able to negotiate better prices for their commodities. Other organizations (spiritual and political) were also found to play a role in instilling values of solidarity and collective action towards the attainment of economic development of the area.

Nyangena and Sterner's study acknowledges the challenges that are presented in attempting to measure social capital. The researchers agree that these challenges may lead to social capital being neglected in policy discourse. However, the study goes ahead to define indicators for measurement as deemed significant to the topical issue. However, issues were noted in their study presented challenges in using social capital as they described it to depict the stock of social capital in the Mara River Basin. First, their study focused on generally homogeneous set ups, with all their study sites comprising predominantly of either Ameru, Agikuyu and Akamba people respectively. This meant that the way people organized themselves and cultural aspects that the people in these communities shared may have influenced the networks existing in these study sites. The authors acknowledge this in their findings by stating that the forms of organization that was exhibited in Machakos may have been attributed to historical and cultural ties that the people shared. Different communities with different ethnic and cultural backgrounds share the Mara River Basin in its entirety. Therefore, the forms of organization and community associations within the basin may

experience different dynamics. Second, despite having outlined their study indicators as group membership, trust and information flow, the study tended to lean more towards the role played by associations in the economic development of Machakos. This brought their study's focus back to a single indicator of social capital and neglected to expound on the role that the other indicators played in making Machakos unique from the other two study sites.

Kirori, Mariara & Ng'ang'a, (2011) investigated the impact of social capital on consumption expenditure of households in Nyeri district of Kenya. The indicators of social capital selected for this study included group membership, trust and solidarity, collective action and cooperation, information and communication, social cohesion, empowerment and political action. The results of the study indicated that social capital, as an asset was an important component of a household's survival portfolio. Aggregate social capital enabled poor households to generate consumption expenditure sources that support non-monetary forms of transactions.

Similarly, their study dealt with a largely homogeneous and rural community and therefore the types of networks that were defined may differ with those in existence within the Mara River Basin. Also, by aggregating social capital within their study area, it became unclear what the contribution of the different dimensions of social capital (structural or cognitive), may have made to reduce the households' consumption expenditure. As stated earlier, what makes social capital a real asset is the investment involved so as to accrue benefits. However by aggregating all the dimensions of social capital in the way that this study did, the specific aspects of social capital that may have been fronted for investment to further build the community's social capital were concealed within the broader measurements.

Mwangi and Ouma (2012) conducted a national survey on the effect of social capital on access to credit. The main indicator of social capital for this study was group membership. The key result for the study was that the more the number of associations a person belonged to, the higher their probability of accessing an informal loan.

Mwangi and Ouma's study was an example of what Paxton (1999), alluded to- a single variable study, which neglects the multifaceted nature of social capital. Their study focused on group membership as an indicator of the strength of social capital that enabled Kenyan access informal loans. The authors neglected other aspects of social capital that may have contributed to people accessing loans. For instance trustworthiness an aspect of social capital and considered an important aspect in monetary transactions was not addressed in this study. Likewise, the role that social capital plays in information flow, which may have increased awareness on the significance of subscribing to an association in order to access credit, was also not highlighted.

These three studies presented scenarios where social capital was measured through different indicators and linked to specific topical issues. Due to the challenges presented, it is however important to note that social capital as defined in these studies can not be used to describe social capital within the Mara River Basin. The Mara River Basin presents a different context comprising of heterogeneous communities spanning both rural and urban set ups. Further, climate change as the topic of interest required a different set of indicators of social capital that may have been more relevant in enabling the research understand how the residents of the basin organized themselves to approach and respond to the climate crisis.

Therefore, as a starting point, the study sought to take stock of what existed in terms of social capital within the Mara River Basin. This was done at household, institutional and societal level with an aim of capturing the structure of these networks and the cognitive dimension of social capital as well, which were deemed significant in enhancing the basin's adaptive capacity.

2.2 Social Capital and Understanding Climate Change

Climate change is a problem that has plagued different communities globally and as such requires different resources available to these communities to address. The human dimension of climate change focuses on the ways in which individuals and societies contribute to global environmental change, are influenced by it, and adapt to it (Munn, 2002). In the recent past, phrases such as climate change and global warming and more recently global cooling have become part and parcel of our lives and debates rage on in the media of the possible causes of climate change and its consequences (Letcher, 2009). Determining what is 'dangerous climate change' however is a societal value judgment, which is based on a contextual risk assessment informed by knowledge of potential impacts, vulnerability and adaptive capacity. Hence, knowledge about the specific causes and effects is key for getting communities to engage in protective strategies, at the same time providing them with a range of options to choose from as a way of survival in the face of the climate crisis (Kroemker & Mossler, 2002; Richardson *et.al*, 2011).

Despite its environmental, social, and economic importance, climate change is a phenomenon that is not easily and accurately identified by the lay public (Weber, 2010). With this in mind, it is therefore imperative to appreciate that different groups and actors produce different knowledge on climate change and adaptation. The recognition of these different sources of

knowledge determines how they are used in decision-making and consequently determine which interests or development paths are prioritized. The appreciation of these varying approaches to knowledge and understandings of the local context, result in different diagnoses of both problems and solutions, and thereby approaches to adaptation often reflect different contexts (Olsson & Folke, 2001; Berkes, 2007).

The role of social capital in aiding the creation of common knowledge in society therefore comes to the limelight. Structural social capital facilitates information sharing, and decision-making through established roles, social networks and other social structures supplemented by rules, procedures, and precedents. This in turn influences collective action. Cognitive social capital refers to shared norms, values, trust, attitudes, and beliefs and these are critical in the filtering processes involved in the transfer of information across different actors (Uphoff & Wijayaratna, 2000). For instance, essential to learning about climate change from external sources is group membership of different sorts, which enables actors to receive information from a wide range of sources and consequently influences perceptions of climate change. This is because the brokerage argument of social capital is that it creates value by exposing people to variation in information (Burt, 2005).

With focus on internal ties that exist within a given society, the term ‘networks’ often mean informal, face-to-face interaction or membership in civic associations or social clubs. The strength of a network is assessed based on the time the actors spend together and the emotional intensity of said relationship. Strong ties have been acknowledged as promoting the transfer of complex knowledge, while weak ties promote the transfer of simple knowledge. (Brehm & Rahn, 1997; Evans, 1996; Ostrom, 1994; Putnam, 1993). Utilizing ties to transfer knowledge requires an investment of both time and effort and so cohesion around a

relationship can ease knowledge transfer by decreasing the competitive and motivational impediments that arise (Hansen, 1999; Reagans & McEvily, 2003). Trust is also central to the acceptance of information from the different sources. Studies have found for example that people pay attention to information about climate phenomena and incorporate it into their decisions and actions, if it comes from a trusted source (Opotow & Clayton, 2003; Slovic, 1997). The structural dimension of social capital, which evolves from social interactions, manifesting as social interaction ties, may therefore stimulate trust and perceived trustworthiness. As two actors interact over time, their trusting relationship will become more concrete, and the actors are more likely to perceive each other as trustworthy (Gabarro, 1978; Gulati, 1995; Granovetter, 1995).

Hence, frequent and close social interactions permit actors to know one another, to share important information, and to create a common point of view (Tsai & Goshal, 1998). Social capital as described would therefore be an imperative resource in society for facilitating access to broader sources of information within networks and improves information quality, relevance and timeliness (Adler & Kwon, 2000). With an objective of creating common knowledge about climate change, social capital would therefore be an invaluable resource that would aid in the transfer of information on causes, impacts and adaptation options amongst actors in society.

Scientific studies have been to establish local peoples' understanding on the climate crisis. Within the African context, studies have stressed the importance of taking into account this knowledge in responding to the climate crisis in different parts of the continent.

Nyanga, Johansen and Aune (2011), conducted a study to document smallholder farmers' perceptions of climate change and conservation agriculture in Choma, Kalomo, Mazabuka,

Monze, Sinazeze, Chibombo, Chongwe, Kapiri Mposhi, Mumbwa, Chipata, Katete and Petauke of Zambia. Their argument was that actors involved in promoting conservation agriculture often did not take into account perceptions of smallholder farmers of climate change and conservation agriculture as an adaptation strategy to the climate crisis. Their study established that most smallholder farmers in Zambia perceived climatic changes in terms of shifts in the timing of seasons, increase in temperature, droughts and floods. For majority of farmers, changes in the rainy season more than other seasons was most notable. They expressed shortening of the rainy season and increased variability in intensity and distribution. Other perceptions related to changes in floods and droughts and these were linked to the adoption of conservation agriculture as an adaptation strategy. According to most of the farmers, supernatural forces caused climate change. The second most common set of causes was associated with environmental explanations that identified deforestation, pollution from industries and modernization as causes of climate change.

Nyanga, Johansen and Aune (2011), highlighted the significance of incorporating social aspects such as perceptions of climate change in the planning of adaptation strategies. Key results from their study indicated that people tend to perceive climate change in terms of changes in climate variables that are significant to their livelihoods. In this case rainfall variability was important to the farmers since it affected their agricultural activities. This points to the relevance of taking into account local perceptions in order to ensure successful adaptation. However, their study did not mention the factors that may have influenced these perceptions. Specifically, the role of the connections that these farmers had and if these had any relationship to the knowledge they possessed on climate change was not captured in this study.

Ogalleh, Vogl, Eitzinger and Hauser (2012), present empirical evidence that demonstrates local knowledge, perceptions and adaptations to climate change and variability amongst smallholders of Laikipia district of Kenya. The study collected both qualitative and quantitative data from methods in Umande and Muhonia sub-locations. The results of their study indicated that smallholders perceived climatic variability as increasingly changing. Some of the local perceptions noted included decreasing rainfalls, increasing temperatures, increasing frosts and increasing hunger. The Palmer Drought Severity Index (PDSI) indicated a trend towards severe droughts in the last four decades, which was also corroborated by the farmers' perceptions. As a response to these changing climatic conditions, the smallholder farmers used a combination of coping and adaptation strategies to respond to variability, including, diversification of crop varieties, migration and sale of livestock. There were significant relationships between perceptions of drought and certain adaptations measures undertaken such as migration and sale of livestock. According to this study, farmers displayed an in-depth knowledge of climatic variability, which they used to inform their coping and adaptation strategies.

Ogalleh, Vogl, Eitzinger and Hauser, emphasized that whilst local knowledge was instrumental in assisting smallholders to cope with climate change and variability, it was also important for policy decisions. According to them, knowledge of climatic perceptions and adaptations provide crucial entry points for decision makers and policy makers to learn how and where to enhance the adaptive capacity of smallholders in rainy and drought periods. However, channels within society that might be explored to enrich local knowledge and consequently enhance local adaptive capacity were not covered within the scope of this study.

Msalilwa, Augustino and Gillah (2013), carried out a study to investigate local peoples' perceptions of climate change in Kilolo District of Tanzania. Their study utilized Participatory Research Approaches mainly Focus Group Discussion and household questionnaires to collect data. Their study results showed that the local people perceived changes in climate in terms of inter-annual rainfall variability and increases in temperature. Their study also established that perception on climate change was different from one individual to another and to some extent influenced by a number of socioeconomic factors such as gender, marital status, age, education, occupation and residence. Based on these varied responses, the study therefore arrived at the conclusion that climate change varied around forest communities in Kilolo and these observed and anticipated changes were affecting their livelihoods.

Msalilwa, Augustino and Gillah, appreciated that as a result of this local knowledge on climate change, communities continued to develop strategies for adapting to the climate crisis. The study advocated that there was need to improve awareness on climate change in order to further enhance communities' adaptive capacity. Unlike the previous studies, these researchers attributed the local knowledge on various social factors therefore alluding to the argument that the formation of common knowledge about climate change involves social processes. However, the study did not delve deep into exploring the extent of these social issues. Hence, the role that social connections play in the transmission of information on climate change was subsequently left out.

Egbe,Yaro, Okon & Bisong (2014), carried out a descriptive study, which attempted to assess perception level of rural people to climate change in Etung, Abu and Kanyang communities in Boki Local Government Authorities of Nigeria. Their study was inspired by the realization

that rural people's indigenous knowledge has been recognized as a powerful and important source of climate change knowledge and therefore critical for formulating mitigation and adaptation strategies. Their study collected primary data from 120 rural dwellers in their communities of interest. The focus of the study was to generate data on knowledge (awareness) level of climate variability/change causes, effects, mitigation and adaptive strategies. Their key results were that 71.7% of the people are aware of climate change and that 66.7% of rural people accepted human activities as major causes of climate change/variability. Further, their results indicated climate change affected these rural populations with regard to poor crop yields, reduced soil fertility, increase flood, poverty and food shortage. The study recommended that the more awareness should be created on the effect of human activities on climate and that indigenous knowledge system should complement global modern knowledge systems to enhance climate change adaptation and mitigation.

Egbe,Yaro, Okon & Bisong, briefly mention the possible sources of this awareness by the rural population as widespread information from environmental education/sensitization by NGOs and extension workers as well as media. However, the significance of these sources of information on climate change is not highlighted. Further, despite the fact the connection between the community and these institutions was an indicator of the presence of social capital in these communities, the study failed to address these links as assets that could be further explored to enhance the local knowledge on climate change.

These aforementioned studies describe the local peoples' understanding of climate change based on their reports on climate variability but do not focus particularly on how these populations arrive at these conclusions. Further, the role of social capital in facilitating

information sharing and filtering on the climate crisis remains undetermined from the empirical data provided by these studies.

Tilahun and Bedemo (2014) however attempted to link the populations' perception to vertical ties with contemporaries and horizontal ties with developmental agencies within the community. In their study where data was collected from 142 farm household heads drawn from Guto, Gida and Sasiga districts of Ethiopia, they sought to examine the farmer's perceptions and adaptation to climate change through conservation agriculture. The main results of their study indicated that the farmers' perception of increase in temperature and perception of decrease in precipitation significantly affected the adaptation to climate change. Further, they argued that households that had increased number of relatives in development groups increased the level of awareness of climate change within that household. They highlighted this as social capital. Similarly, the study established that farmers' perception of climate change was affected significantly by information on climate, farmer-to-farmer extension. The farmers' education level, availability of family labor and their main employment were also seen as significant variables in determining participation in conservation agriculture as adaptation to climate change.

Tilahun and Bedemo's research however presented a few weaknesses that prevented the results from being generalized to reflect the situation within the Mara River Basin. First, their study was conducted amongst homogeneous group- farmers. This does not mirror the Mara River Basin which consists of several spatially-varied land uses including forest conservation and smallholder agriculture in the upper catchment, wildlife conservation, pastoralism and large-scale agriculture, mid catchment and mining and smallholder agriculture downstream. Second, their study only highlights bridging ties exemplified by group membership as social

capital. Yet even within the same study there is mention of farmer-to-farmer relations, which denote bonding ties that enhance perceptions of climate change but are not recognized as social capital. This once more presents the challenge of using a single variable to determine social capital, which does not capture its multi-dimensional nature. Finally, their study acknowledges that within the study area, it was noted that the agro-ecological setting of farmers influenced the perception of farmers of climate change. That is, different farmers living in different agro-ecological settings perceived the occurrence of climate change differently. This brings to fore the aspect of uniqueness of context with regard to climate change studies. Clearly, different people within different contexts experience climate change differently and are therefore bound to perceive it differently.

Therefore, having established the significance of local understanding of climate change as an intervening variable to adaptation to the crisis. This study therefore sought to address that gap by looking at how the stock of social capital within the Mara River Basin facilitated the flow of information and thus enabled the formation of common knowledge about climate change.

2.3 Social Capital and Adaptation to Climate Change

Society will not be static as the climate changes, therefore adaptation to the crisis is now considered essential in order to reduce the impacts of climate change that are already happening and to increase the resilience to future impacts, some of which cannot be reversed. Given the scale of projected impacts and experience of climate change already, the window of opportunity for adaptation is narrow. Adaptation refers to adjustments in ecological, social or economic systems in response to actual or expected climatic change and their impacts. It refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change. However, issues such as

population growth in high-risk locations, increasing inequality, and weakening of social networks are likely to exacerbate vulnerability and reduce the capacity of communities to adapt (Berrang, Ford, Furgal & King, 2010; Parry & Carter, 1998; Smit & Pilifosova, 2001). Apart from these social, environmental, institutional, and economic stresses that are likely to further exacerbate impacts and constrain adaptive responses for vulnerable people and regions, it is also key to note that despite changes in weather extremes and increasing awareness (although not universal) of climate-change risks, adaptation activities are still poorly embedded in planning systems. This might result in maladaptation in instances where adaptation activities being undertaken today might not be sustainable due to poor planning and projections (Adger & Barnett, 2009; Berrang-Ford, Ford, Furgal, & King, 2010; Ford & Smit 2003; Moser & Luers, 2008; Repetto, 2009; Tribbia and Moser, 2008).

The proposition that natural resources need protection from the destructive actions of people is widely accepted and communities have shown in the past and increasingly today that they can collaborate for long-term resource management. Studies have shown that an integration of socio-cognitive factors could more effectively explain adaptive behavior than purely socio-economic factors (Grothmann & Patt, 2005). Hence the attempt to link social capital and adaptation processes in society. The term social capital captures the idea that social bonds and norms are critical for sustainability and are important for people and communities. Social capital has been hypothesized to lower the transaction costs of working together and hence facilitate cooperation. According to Pretty (2003), people tend to have more confidence to invest in collective activities in the presence of social capital because they know that others will also do so. As such, they are also less likely to engage in unfettered private actions with negative outcomes, such as resource degradation. Four features of social capital are important in this regard; relations of trust, reciprocity and exchanges, common rules, norms, and

sanctions, and connectedness in networks and groups. Dietz, Ostrom and Stern (2003), suggest that amongst other factors, the effective commons governance (which is crucial for responding to climate change), is easier to achieve when communities maintain frequent face-to-face communication and dense social networks, that increase the potential for trust, allow people to express and see emotional reactions to distrust, and lower the cost of monitoring behavior and inducing rule compliance. According to Putnam (1995), collective action depends upon social networks either bonding or bridging networks that already exist, but can also be an avenue to foster new networks.

Scientists around the world agree that today's global climate change is mainly caused by people's activities and hence the need to change the perception that its 'a future generations' problem. Therefore, since a large number of individuals have contributed to the damage on the environment that is resulting in climate change, the solutions likewise need to be actions to which everyone can contribute (EPA, 2011; Gore, 2009; Houghton, 2009). Social capital therefore presents the necessary "glue" for enhancing communities' adaptive capacity, particularly in dealing with unforeseen and periodic hazardous events (Burton, Huq, Lim, Pilifosova, & Schipper, 2002). Because vulnerability, coping ability, as well as the physical climate change impacts vary greatly among different regions and communities, it is likely that using a more localized focus which takes into account local understanding of the phenomenon, will be successful in increasing long-run resilience to climate change. Unfortunately, much of this indigenous coping knowledge is not well documented in the scientific literature and so is not incorporated into planning processes (Richardson et al., 2011; Smit & Pilifosova, 2001).

Having reviewed the theoretical literature that indicates the potential benefit of social capital

to climate change adaptation, the research sought to establish what empirical works advance about this role within the African context.

Scheffran, Marmer and Sow (2012), conducted a study to establish how migratory networks contribute to climate change adaptation. Migration due to extreme climatic changes is one of the effects already observed and projected to get worse in Africa. According to this study migrant social networks indicated the capability to help to build social capital in order to increase the social resilience in the communities of origin. The results of the study exhibited that this enhanced social capital triggered innovations across regions through transferring knowledge, technology, remittances and other resources back home. The study focused on the Western Sahel region with specific focus on Mali, Mauritania and Senegal. In Mali, the study established that in Kayes, which is part of Senegal River Valley, people had been forced to migrate due to desertification and drought. Some of these migrants eventually ended up in Europe and the United States of America. The study established that the migrant organizations formed in the host countries co-financed most of the development projects geared towards improving Mali's resilience to climate change. These include projects to put up water tanks, wells, dikes, health centers and schools amongst others. Similarly in Mauritania, emigrants forced to move away due to severe drought cooperated with NGOs in host countries to support development initiatives in their home country. Out of the 18 projects initiated by Mauritanian Diaspora organizations, 14 were classified as climate change adaptation activities. Senegal presented a similar situation whereby emigrants residing abroad made monthly contributions that were remitted back home to support water projects. The study results indicated that these associations funded 70% of all water projects in Senegal.

Scheffran, Marmer and Sow's study took cognizance of the human dimension of climate

change by documenting the impact of the crisis on human settlement. Further, their study brought out an interesting facet of linking social capital and presented the potential this form of social capital held in building resilience as an adaptation strategy. However, they focused mainly on external links and how these could be harnessed to enhance communities' adaptive capacities. The community experiencing climate change effects in this case appeared to be passive receivers of the benefits accruing from social capital. In other words, the scope of the study did not explore how internal networks within these countries of origin contributed to enhancing their own adaptive capacity. Consequently, it appeared like the study primarily focused on one form of social and neglected other aspects that might be just as critical in making adaptation to climate change successful.

Rodima-Taylor (2012), in a study exploring local collective action towards climate change adaptation in Tanzania, concluded that informal associations were becoming increasingly important in shaping and mediating local adaptation practices. The study results indicated that small-scale local associations facilitated collective experimentation and risk management and in turn contributed to enhancing the resilience and sustainability of the social-ecological system. Through economic cooperation, income diversification and dispute mediation, the Kuria people of northwest Tanzania, were able to contribute to the management of natural resources. The study advanced that the structure of the organizations enabled community members come up with innovations in response to the climate crisis whilst facilitating alternative patterns of communication, which provoked flexible and interactive connections between different actors in the community thereby enhancing the community's adaptive capacity.

Rodima-Taylor highlighted the features of the local institutions that potentially enhanced local adaptive capacity. It appreciated that connections between actors in this particular society enhanced adaptation to climate change by reducing financial costs and creating common knowledge on the crisis through improving the flow of information. However, the focus of this study reflected only one aspect of social capital that is, membership in associations and the resulting benefits. It neglected other aspects of social capital at household and society level. Additionally, even with respect to the associations, the study leaned more towards the structural aspect but did not address the cognitive dimension.

Adger and Berrang (2009), having conducted a review of 1741 peer-reviewed, English-language documents reporting on climate change and adaptation, argue that there is limited understanding of how climate change adaptation is taking place. Three features amongst their results provided further impetus for the study on establishing how social capital contributed to adaptation to climate change within the Mara River Basin, Kenya. First, they established that only 13% of documents focused on human systems; second, their results indicate that despite considerable research on adaptation having been conducted, the majority of studies reported on vulnerability assessments and natural systems (or intentions to act), not adaptation actions; and third, adaptation actions that were reported more frequently focused mainly on developed nations, with middle income countries underrepresented and low-income regions dominated by reports from a small number of countries.

In Kenya for instance, there is a shortage of scientific knowledge that recognizes and documents the role of community ties and networks in responding to the climate crisis. One such study is noted to have attempted to link social capital to climate change adaptation. A study by Kithiia (2010), explored the possibility that social capital could be beneficial to

communities at the coast of the country in addressing climate change. The study highlighted how Majaoni Youth Group together with the Fisheries and Forest departments at the coast cooperated to rehabilitate and preserve mangrove forests along the Mombasa coastline.

Kithiia's study appreciated the potential that lies in social capital with regard to adaptation to climate change. However, the study exhibited challenges that may have deterred its findings from being generalized to reflect the situation in Mara River Basin with regard to social capital's contribution to climate change adaptation. First, as a concluding remark his study states that these activities undertaken on the Kenyan coast were without any regard for adaptation to climate change but acted as an indicator to the potential that social capital holds in future adaptation strategies. This indicates that these activities could not therefore be referred to as adaptation but were more like coping mechanisms, since adaptation requires forethought and planning. Second, the study took a broad approach to the connotation of these ties by generalizing social capital as group membership and linkages with government institutions. There was also no delineation the two different dimensions and explanation of how they contributed to adaptation to climate change. This did not fully represent the multiple dimensions of social capital and was therefore not exhaustive. Third, Kithiia's studies have focused on the coastal region, which is essentially different in terms of social characteristics and structures.

Given the limitations presented by these empirical studies and the arguments made for social capital in theoretical research, this study therefore sought to contribute more knowledge on the role of social capital in instigating actions towards climate change adaptation within the Mara River Basin.

CHAPTER 3: METHODOLOGY

This chapter describes the study area in terms of its location and population. It also provides a detailed account of how the field data was collected in terms of the study design. This included methods of data collection used, how the respondents for the study were sampled and the ethical issues taken into account during the period of study. It also provides an explanation of how data was analyzed to arrive at the study findings.

3.1 Study Design

The study employed a cross sectional descriptive design aimed at collecting quantitative and qualitative data. This meant that the study involved a one-time interaction with individuals and groups of people within the study area (Neumann, 2007). This provided quantitative or numeric descriptions of the population, patterns and trends with regard to social capital, and adaptation to climate change as provided by the sampled respondents from the six selected locations. The respondents were males and females, from different socio-economic classes, with different abilities and accomplishments ranging from 18 years of age. The study collected primary data from 400 respondents from sampled households within the six selected locations within the basin; key informants from government ministries and non-governmental organizations; and Focus Group Discussion with mobilized community participants through the use of rapid appraisal tools.

3.2 Study Area

Mara River Basin is one of drainage basins that feeds into Lake Victoria and is ecologically related to the socioeconomic activities of the lake. The Mara River originates from the Napuiyapui swamp in the Mau Escarpment (2,932m above sea level) and flows through the plains of Maasai Mara National Game Reserve in Kenya and Serengeti National Park in

Tanzania before entering Lake Victoria, 1,134m above sea level (Fig 3). The Mara River Basin covers approximately 13,750 km^2 and is shared between Kenya (65%) and Tanzania (35%). Kenya holds a key responsibility in determining the future of this basin, as the basin's headwaters stem from Kenya's Mau Escarpment and Loita Hills. The basin is located between longitudes 33º 47' E and 35º 47' E and latitudes 0º 28' S and 1º 52' S.

The main perennial tributaries of the Mara River are Amala and Nyangores, which drain the Western Mau Escarpment. Other tributaries include the Talek, which starts from Loita plains and joins the Mara in the Masai Mara National Reserve (MMNR), the Engare Ngito, originating from the Ilmotiookoit ridges, and the Sand River, which is the last main tributary, joining the Mara at the Kenya-Tanzanian Border in the Serengeti plains. The Mara River then flows through Tanzania and into the Mara Swamp, finally draining through the Mara Bay into Lake Victoria at Musoma. Mean annual rainfall ranges between 1,000-1,750 mm in the Mau Escarpment, 900-1,000 mm in the middle rangelands, and 700-850 mm in the lower Loita hills and around Musoma. There are two rainy seasons between March and June, and November and December (WWF ESARPO, 2011).

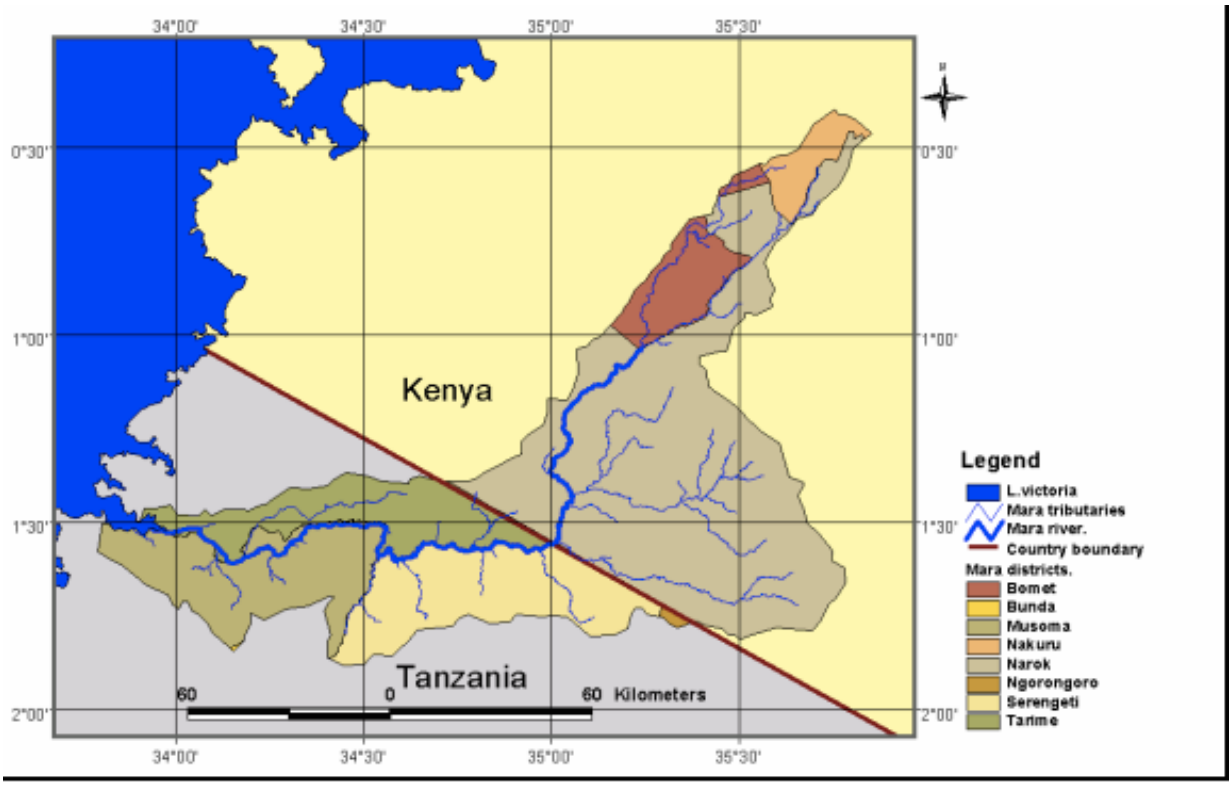

Figure 3: Map of Mara River Basin. Source: WWF ESARPO (2011)

The Mara River Basin is a trans-boundary basin shared between Kenya and Tanzania, and is also part of the larger Nile Basin that is shared by nine countries. Several rivers and springs form the Mara River catchment basin, including five principal tributaries (USAID, 2006). From its source in the Kenyan highlands, the river flows for about 395 km and drains into Lake Victoria. The basin is divided into three administrative units with different and unique land use patterns. On the Kenyan side the basin can be divided into upper catchments, middle rangelands and savannah plains (Table 1).

Table 1: Zones and Land Use Patterns in the Mara River Basin

Zone	Dominant Land Uses
Forested upper catchments (up to 3100m altitude)	Mau forest complex (Mau forest is referred to as a Kenya's water tower - it stores rain during the wet seasons and pumps it out during the dry months) Small scale subsistence agriculture (tea/ maize/ livestock)
Middle rangelands	Small scale agriculture Livestock grazing Settlements – Mulot, Bomet
Savannah plains	Large scale irrigated farming (wheat, maize) Maasai ranches / conservancies – large herds of cattle, sheep and goats using free range grazing Protected Areas for Wildlife with tourist facilities (it is estimated that the Maasai Mara has more than 140 facilities with a total bed capacity of over 4000.)

Note: From Documentation of WWF's Mara River Basin Management Initiative, 2011

The Mara River Basin is home to different communities including the Kalenjin and Maasai, who make up most of the population of the selected larger clusters of Bomet and Narok counties respectively. The basin provides water, which is crucial for execution of domestic activities, livestock farming to wildlife maintenance and irrigation for agriculture. This also means that the different communities have direct stakes in the management of the river basin. The different kinds of activities and the wide expanse of the basin brings to fore different degrees of climate change vulnerabilities and variability. The rationale for selecting this study site was therefore pegged on the importance of this river basin in contributing to the national economy and supporting the livelihoods of the different communities that lived within it. Further, the existence of these different communities presented an issue of the governance and management of a common resource thus bringing up the question of the existence of social capital and the role that it played in the management of the basin.

The Mara River Basin is facing serious environmental problems primarily created from wide spread encroachment on protected forests and other fragile ecosystems for settlement and cultivation. These include: Soil Erosion and high sediment loads; Deforestation resulting from encroachment and human settlement in the Mau forest areas; Wildlife-human conflicts resulting from large-scale farming that has extended into wildlife corridors; Declining water quality and quantity due to poor agricultural practices and excessive water abstractions; Pollution due to unregulated wastewater discharges, especially from mining activities, poor sanitation facilities and excessive use of agro-chemicals for pest and disease control in crops and livestock; Increased frequency and intensity of floods and droughts due to climate variability and land use change; Uncoordinated water resources planning and management processes due to lack of a comprehensive cooperative framework for trans-boundary water resources management. The situation is further exacerbated by the weak and poorly enforced water related laws and regulations, and water resources management institutions with inadequate technical and financial capacity to monitor and ensure compliance with established standards and regulations (Water Resources and Energy Management International, 2008).

This made the basin an intriguing area to conduct the study as it presented an opportunity for the assessment of linkages and networks amongst and between the different communities sharing the resource. Further, the study sought to establish if these linkages/networks created any responses with regard to adaptation to experienced climatic effects.

3.3 Study Population

The population in the Mara River Basin is approximately 1.1 million people with 775,000 living on the Kenyan side and 325,000 in Tanzania (WREM, 2008). The study focused on the Kenyan side of the Mara river basin specifically Bomet and Narok counties comprising of a total population of 714,948 (GoK, 2010). The study population was drawn from 6 locations lying on the borders of these two Kenyan counties.

3.3.1 Sampling and Sample Size

The sampling unit for the questionnaire survey was the household whence one adult individual was drawn for the household survey. The study incorporated both probability and non-probability sampling techniques and multi-stage sampling was used to arrive at the sample size for structured interviews. First, the Basin was divided into two clusters: middle rangelands, represented by Bomet County at 1750m, and savannah plains defined by Narok County at 1100m above sea level. From each of these counties, three locations that lie along the border were purposively sampled to allow for assessment of trans-boundary associations. The sampled locations were Mulot, Kiplabotwa, Enelerai, Chemaner, Kipreres and Ilmotiok with a population of 82,851 people and 15,782 households.

A formula developed by Yamane (1967) was used to arrive at the number of households per location from which individuals to be interviewed were drawn.

$$n = \frac{N}{1+N\,(e)^2}$$

Where:

n is the sample size,

N is the population size and

e is the level of precision.

The level of precision or sampling error for the study, was taken as + or - 5% and a confidence level of 95%. The total number of households in the six locations was 15,782 according to the latest published population census (GoK, 2010). The sample size was then calculated as follows:

$$n = \frac{15,782}{1+ 15,782(.05)^2}$$

$$n= \frac{15,782}{15,783\ (0.0025)}$$

$$n= \frac{15,782}{39.46}$$

$$n= 400$$

This was proportionately divided into six (Table 2).

Table 2: Sampling Frame

Location	No. of households	Sample %	Sample	Sampling Interval
Chemaner	2,108	14.5	58	36
Kipreres	1,849	7.8	31	60
Mulot	4,212	23.3	93	45
Kiplabotwa	2,828	17.8	71	40
Enelerai	2,330	15.5	62	38
Ilmotiok	2,455	21.3	85	29
Total	**15,782**	**100**	**400**	

Note: Compiled from GoK population census 2009

Systematic sampling was then done by dividing the number of sampled households (n) by the total number of households (N) for each location to provide the sampling interval (k). One adult individual, who had to either be the head of household or spouse, was interviewed from each sampled household.

Twenty-four community members were mobilized for Focus Group Discussion through the local and non-governmental organizations working in the area. The participants were drawn from across the basin so as to get the general views of the different segments of the population with regard to social capital within the community, changes in climate patterns and some of the strategies for adaptation. Four participants were drawn from each main cluster (location). Of the 4, the requirement was the inclusion of 1 man, 1 woman, 1 elderly person (65 years and above) and 1 youth. The elderly persons were all put in one group. The rest were divided into the remaining two groups of 9 participants each.

Further information was collected from 12 identified key informants. This was done through a guided discussion with a checklist on issues to be addressed. The key informants were personalities identified through purposive sampling who have authority on issues of Mara river basin management and climate change. These informants were government officers from the Ministries of Public Health, Water and Irrigation, Environment, Agriculture, Planning and Devolution. There was also representation from the non-governmental sector which included the project managers and coordinators, World Wide Fund for Nature, Mara River Basin Management Initiative and the officials of Mara River Water Users Association.

3.4 Data Collection Methods

The study incorporated both quantitative and qualitative methods of data collection. The use of these complementary methodologies allowed for confirmation and corroboration of information received through triangulation. This also provided the research with richer explanations for the numeric data collected. The complexity of the concepts of social capital and climate change also called for methods such as in-depth interviews and Focus Group Discussion, that gave an insight into people's perceptions, attitudes, values of the study community. This was achieved whilst at the same time giving an insight into people's relationships and behavior within the community. The data collection was done at two levels, namely primary data collection and secondary data collection. Primary data collection methods involved contact with the respondents through the use of interviews, whilst secondary data collection was mainly an analysis of documents provided by organizations within the study area with regard to social capital and climate change.

3.4.1 Primary Data Collection

3.4.1.1 Questionnaire Survey

A structured questionnaire was administered through a face-to-face survey to adult individuals in the 400 systematically selected households. This provided a first hand perspective on issues pertinent to the types of social capital that existed within these particular communities; the community's perception of climate change; the different adaptation measures that individuals, households and groups undertook to deal with the experienced impacts of climate change; and whether social capital may or may not have contributed to the said adaptation strategies. The questionnaire contained skips, closed questions (whose responses were coded), open –ended questions and the language was also

simplified to eliminate ambiguity. The open-ended questions facilitated probing where further explanation is required. The questionnaire was further sub-divided into three sections to allow for clarity and ensure that all the pertinent issues had been captured.

The first section intended to capture the demographic characteristics of the study population. The objectives of this section were to first and foremost provide an entry point into the households and present an opportunity for formal introductions. Second, the section sought to familiarize the research with the household roster and characteristics like sex, age, hierarchical relationship, marital status, occupation and education level; all for later reference in relation to social capital and climate change.

The second section provided a comprehension of the various facets relating to structural and cognitive social capital. These included respondents' affiliation to local networks both informal and formal, the characteristics of these networks and issues of trust, reciprocity, participation, social engagement and commitment. This information was used to make generalizations about the strength of social capital in the study area and provide a basis for relating this to issues relating to climate change adaptation.

The third and final section assessed the communities understanding of what climate change is, its causes, impacts and adaptation measures adopted by the households and the groups that the respondents were affiliated to. These issues were then to be analyzed in reference to information collected in the previous section to give an understanding of the possible effect of the existence of social capital on climate change adaptation.

3.4.1.2 Focus Group Discussions

These discussions provide corroboration for the information collected during the household survey. The discussions gave an insight on issues faced by the populace in terms of noted patterns of climate change over time, its impacts, networks and linkages within the general community and if these networks play a role in the development of strategies for adaptation to climate change. This was done through a discussion guide on issues of focus and with the aid of participatory rapid appraisal tools (PRA), which were used to tease out information from the participants. Participatory rapid appraisal is a social science approach that emerged in the late 1970s. The basic idea of PRA is to quickly collect, analyze and evaluate information on rural conditions and local knowledge. This information is generated in close co-operation with the local population, which meant that the research methods had to be adjusted to local conditions, that is, they were tailored to meet the communication needs of people without formal education or people who are not used to communicating in scientific terms. One of the key principles of PRA is the visualization of questions and results by using locally comprehensible symbols and therefore tools such as mapping, diagramming and ranking were developed or improved in order to gather information (Sontheimer, Callens & Seiffert, 1999)

The research utilized Venn Diagramming as a participatory technique during the FGDs. This tool was used to provide an overview of the organizations/institutions that are found within the Mara River basin and also provided a basis for institutional ranking based on the benefits accrued. The participants were first asked to list all the organizations and institutions working in the area. Then using circles for illustration, they used the largest circle to represent the organization they felt were most important to them and the smallest circle represented the least important. These were then placed inside a bigger circle that represented the community

(Figure 4). The participants during presentation then discussed and agreed on why certain organizations and institutions were more important than others.

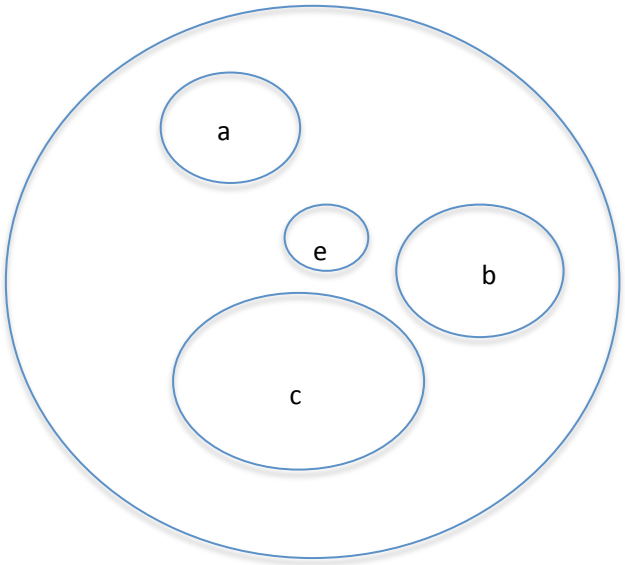

Figure 4: Venn Diagram Layout.

The researcher also conducted a Historical Trends and Timelines Analysis. This tool provided a human dimension to data by allowing participants to give their own perspectives on changes observed about climatic conditions. It showed changes from one year to the next and, therefore, provided a good means of tracking longer-term changes while stimulating a valuable discussion about the speed and extent of these changes (Figure 5). That is, why a situation is as it is, and why different groups or individuals hold the views they do (Guijt & Woodhill, 2002). The tool enabled the researcher to obtain a historical understanding of sequential changes with regard to climate change over a time span of forty years. This was done with the assistance of the older generation within the group since these were the people who had experienced first hand the climatic changes that had occurred within the study area over the decades. The participants were expected to give a historical analysis of climate change indicators including, weather patterns, extreme events, vegetative cover, water resources, land use patterns and disease outbreaks from the 1970s to the new millennium.

This was expected to provide the trends with regard to the identified issues and an insight into their contribution to experienced climatic changes.

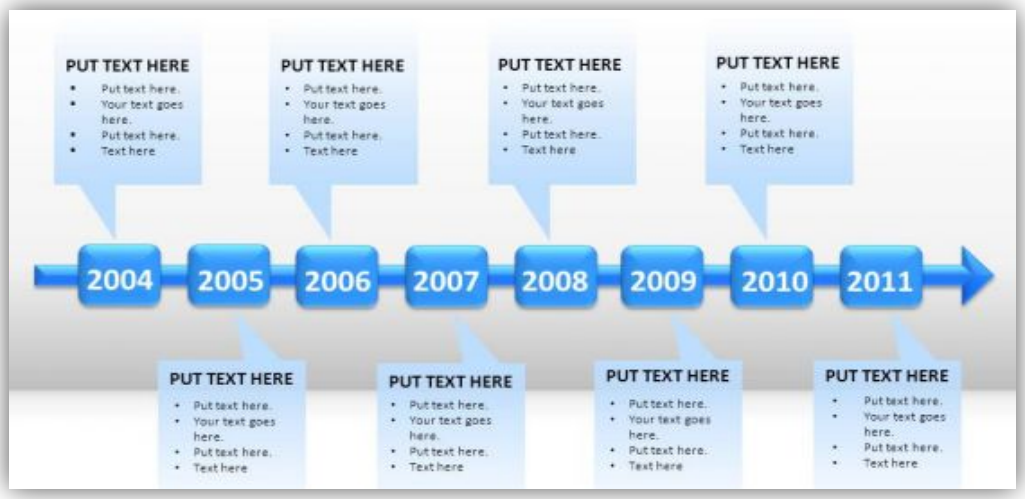

Figure 5: Historical Trends and Timelines Analysis Layout. Source: http://www.slideteam.net

A Force-field analysis was also done with the participants of the FGD. Kurt Lewin developed this tool from the premise that any situation, interpersonal as well as physical, is held in a stable position by a series of equal and opposite forces (Figure 6). Change comes about when the forces become out of balance. Thus to create a desired change, analysis of the forces for change and those against change, enables consideration of the options available to strengthen the forces driving the change and weaken the forces against the change (Lewin, 1947).

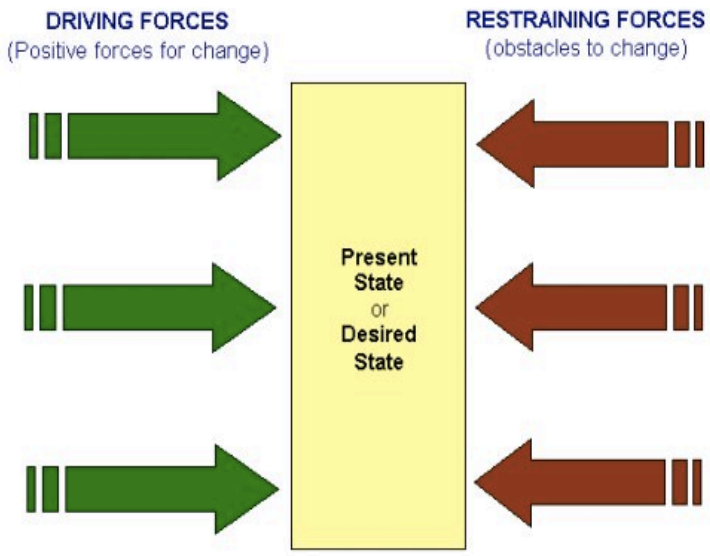

Figure 6: Force Field Analysis Layout. Source: http://www.changemanagement-coach.com

Having identified the current climatic predicament through the trends and timelines analysis, this process enabled the community to arrive at some of the driving forces (helping factors) that may have contributed to the situation quo and restricting forces (hindering factors) that may help in bettering the situation.

3.4.1.3 Key Informant Interviews

Interviews were held with the twelve purposively sampled key informants who were believed to have crucial information in relation to management of the river basin and climate change within the river basin. Appointments were made for in-depth interviews using a guide focusing on the organizations' networks, how they link with the community within the study area, extreme events attributed to climate change and their function in building the community's response to the climate crisis.

3.4.1.4 Pilot study

Before the commencement of the main study, a pilot study was done to establish how feasible the research was and to check for the soundness of the research tool. This informed the researcher on areas where research protocols may not be followed, or whether proposed methods or instruments were inappropriate or too complicated. This reduced the risk of the main research project failing (Winter & Hundley, 2001).

The research instruments were piloted in Kembu, a location within the Mara River Basin with similar characteristics to the sampled locations. The main focus of the pilot was to check if the tool was able to give the needed information reliably, the flow and presentation of questions, if the pre-categorization of questions into sub-sections was adequate and if there were any general challenges in handling the instruments. Other problems such as poor recording and response rates were also identified and precautionary procedures were devised. The pilot study also presented an opportunity to note the time taken to administer the questionnaire so as to work out the possible number that could be handled comfortably in one day.

3.4.2 Secondary Data Collection

The study integrated information on the study topic from publications by authors with expert views and organizations and institutions that have conducted research in the fields of social capital, issues of river basin management and climate change. The study also made use of documents provided by organizations, governmental and non-governmental, working in the area. This was done to ensure that the study stayed on course and remained relevant to the pertinent issues.

3.5 Data Analysis and Presentation

Quantitative data was cleaned, coded, entered and analyzed in SPSS version 21.0, to allow for the development of frequencies, modes and means. Histograms and pie charts were used to add visual appeal to the presentation of quantitative findings. Qualitative data, which was represented by information from the Focus Group Discussion and Key Informant Interviews, was transcribed, organized thematically (according to the study objectives) and then presented verbatim or in prose to give emphasis to selected themes of focus.

3.6 Ethical Considerations

Before the collection of primary data began, permission was sought from Maseno University Ethics Committee. The local administration of the selected areas was also informed about the study to ensure the safety of the researcher during the period of research.

During the period of study, the researcher observed proper research protocol. First, only respondents aged 18 and above were targeted, given that they were of consensual age and were more conversant with the salient issues at hand. The respondents were also informed what the study was all about and how the information obtained was going to be used. Their informed consent was then sought to proceed with the interview (Appendix 1). They were also assured of confidentiality of their identity and that no responses would be traced back to any particular individuals interviewed for the purposes of the study.

CHAPTER 4: DATA ANALYSIS, PRESENTATION AND DISCUSSION

This chapter describes the socio-demographic characteristics resulting from the data collected within the study area. It further presents the results from the field data documenting the dimensions of social capital, the influence of social capital on the community's understanding of the climate change phenomena and finally the role that social capital plays in facilitating adaptation strategies towards the climate crisis.

4.1 Socio-demographic Characteristics of the Study Respondents

In this section, the basic socio-demographic characteristics of the sample were reviewed. The study drew its study population from Chemaner, Kipreres, Kiplabotwa locations of Bomet County; Mulot, Enelerai and Ilmotiok locations of Narok South County. The number of respondents interviewed was derived from the total number of households within each location, to make up the sample size. Out of the 400 respondents interviewed, 70% were male and 30% were female.

Table 3: Number of Sampled Household Per Location

Location	No. of households	Sample
Chemaner	2,108	58
Kipreres	1,849	31
Mulot	4,212	93
Kiplabotwa	2,828	71
Enelerai	2,330	62
Ilmotiok	2,455	85
Total	**15,782**	**400**

Note: Retrieved from GoK Population Census Data

The study ensured that all the respondents interviewed were of or above the legal age of adulthood according to the Kenyan constitution. The youngest person interviewed was 18

years of age and the oldest was 87 years old. The average age of the respondents was 39.68 whilst the median age was 37 years.

Table 4: Age of Interviewed Respondents

Age of Respondents	
Mean	39.68
Median	37.00
Minimum	18
Maximum	87

With regard to the marital status of the respondents, the bulk of them (76.6%), were married. The remaining 23.4% were single headed households as a result of the death of a spouse, separation, and divorce or by choice (Table 5).

Table 5: Marital Status of Respondents

Marital status	Frequency	Percentage
Married	307	76.6
Single	31	7.9
Separated	11	2.8
Divorced	6	1.5
Widow/widower	45	11.2
Total	**400**	**100.0**

The household sizes within the study area were relatively small (Figure 7). The average household size was 4.29 with majority of the households having between one and three dependents below 18 years of age. The households with the least members (3.75%) comprised of just one person while the household with the most members (1%) had nine members.

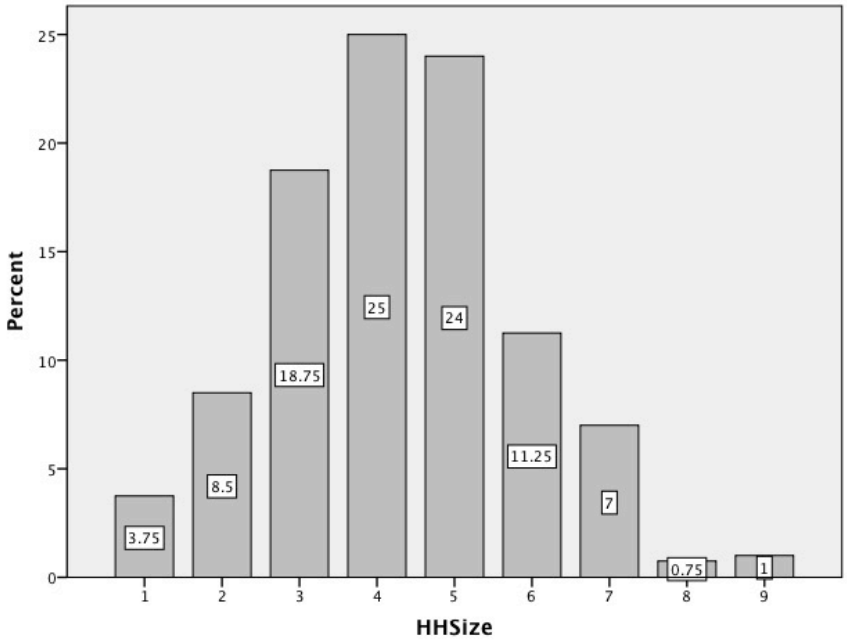

Figure 7: Household Sizes in Study Area.

Most of the respondents had acquired basic education with the highest (49%), of the respondents having acquired primary school level education. Almost quarter of the respondents (24.9%) had gone up to secondary school level while 14.5% had acquired tertiary level education.

Table 6: Education Level of Respondents

	Frequency	Percentage
None	36	9.1
Pre-primary	10	2.5
Primary	193	49.0
Secondary	98	24.9
Post secondary	57	14.5
Total	**394**	**100.0**

Being a predominantly agricultural region, most of the respondents (52%) were engaged in farming as their main source of livelihood. Trading and salaried employment also occupied a substantial percentage of the populace at 21.3% and 10.7% respectively.

Table 7: Occupation of Respondents

Job	Frequency	Percentage
Farming	208	52.0
Trading	85	21.3
Fishing	2	.5
Artisan	5	1.3
Salaried employment	43	10.7
Student	7	1.8
Unemployed	37	9.2
Self Employed	13	3.2
Total	**400**	**100.0**

These socio demographic characteristics had an implication on the various aspects of the study. They influenced the structure of the community, how the community members within the study area interacted with each other, and how they formed bonds and ties and thus how social capital was cultivated and sustained. This was in turn expected to affect their understanding of the climate change phenomenon and even more importantly how they rallied themselves to respond to it, either as individuals or as a collective. The next section goes ahead to examine exactly how these socio demographic characteristics influence the different dimensions of social capital.

4.2 Dimensions of Social Capital within the Mara River Basin

At the heart of social capital is the supposition that social networks are valuable and it gives rise to norms of trust and reciprocity. This section therefore sought to assess the structural organization, in the form of types of networks that existed within the Mara River Basin and how these supported or cultivated social capital. The section further evaluated the cognitive aspect, in terms of the norms that were resultant of these connections.

4.2.1 Structural Social Capital

As noted in the theory section, the structural dimension of social capital refers to patterns of connection amongst members of a social network. Social capital is believed to vary depending on the type of network and social scale. This was operationalized in the questionnaire by ascertaining what kinds of networks the residents of Mara River Basin belonged to. These included informal and formal networks and the types of activities the actors within these networks undertook as an entity. The research therefore assessed the different types of networks that existed within the Mara River Basin in terms of their sizes, spatial nature and structure.

4.2.1.1 Informal Networks

The research began its assessment by looking at society's basic unit, the family which as a network is argued to be the primary source and bed rock of social capital (Bourdieu, 1993; Fukuyama, 1999; Putnam, 1995). In a quest to establish social capital within the family, the respondents were asked to provide a list of family members and dependents that have been sharing meals within that said household at least once a day for the last six months. The purpose of this was to establish that there was regular interaction amongst members of the household (Appendix 1). Coleman (1988) argues that the frequency of interaction within the

family unit indicates a high degree of closure that results in effective norms. Therefore, as shown by the household roster in the Mara River Basin, the daily interaction of household members within the study area indicated that households had strong bonds that were able to encourage positive attributes of family members whilst guarding the unit against negative externalities like the climate crisis.

On average households in the study area comprised of 4.29 members. Further, out of the 83.9% households with dependents below the age of 18 years, 73.6% had between 1 and 3 of these dependents. This result presented a different scenario from that indicated by the 2009 Kenya National Housing and Population Census, which indicated that the average household size in Kenya had grown to 6.98 (GoK, 2010). Edwards, Franklin and Holland (2003), support this result in their theoretical review of social capital works. They argue that the size of the household is important because the more children parents have, the more this attention gets diluted. The results from the Mara River Basin therefore imply that children and adults alike within the households were able to share quality time with each other and hence benefit and draw on each other's human capital. This could be critical for providing support when making adjustments to livelihoods based on climate change impacts.

A further analysis was done to determine the marital status of the adults in the households against the number of dependents below 18 years of age (Table 8). The reason for this was to establish the ratio of adults to children, as well as the number of married adults with children because this indicates the strength of social capital found within the family.

Table 8: Marital Status Versus Dependents Below 18 Years Old

		Total Below 18yrs in HH							
Marital status		0	1	2	3	4	5	6	Total
Married	Count	34	82	87	64	29	6	1	303
	Dependents	*0*	*82*	*174*	*192*	*116*	*30*	*6*	*600*
								Ratio	**1:2**
Single	Count	16	6	5	4	0	1	1	33
	Dependents	*0*	*6*	*10*	*12*	*0*	*5*	*6*	*39*
								Ratio	**1:1**
Separated	Count	3	3	5	0	0	1	0	12
	Dependents	*0*	*3*	*10*	*0*	*0*	*5*	*0*	*18*
								Ratio	**1:1.5**
Divorced	Count	0	1	1	3	1	0	0	6
	Dependents	*0*	*1*	*2*	*9*	*4*	*0*	*0*	*16*
								Ratio	**1:2.6**
Widow/ widower	Count	11	9	15	8	1	0	0	44
	Dependents	*0*	*9*	*30*	*24*	*4*	*0*	*0*	*67*
								Ratio	**1:1.5**
Total	**Count**	**64**	**101**	**113**	**79**	**31**	**8**	**2**	**398**
	Dependents	***0***	***101***	***226***	***237***	***124***	***40***	***12***	***740***
								Ratio	**1:1.9**

The results show that on average, the ratio of adults to children below the age of 18 years was 1:1.7, which was an indicator of strong bonds within the family unit. According to Coleman (1988), the presence of two adults strengthens the structure of the family set up and that this allows for parents to reinforce each other when it comes to sanctions for their children's behavior. He further argues that children are strongly affected by human capital possessed by their parents. Therefore the results from the Mara River Basin indicate that parents were investing in their children by being physically present, giving them attention and developing an intense relationship with them. Further, the presence of married adults within most of the households indicated strong social capital within the family, which enabled children to access the human capital possessed by both parents. This amount of influence on children could also have translated to parents enforcing behavior that could be beneficial for adaptation to climate change within the study area.

All the respondents within the households interviewed made reference to a head of household (male or female), that is, they were either the head of household or spouse of the head of household. This meant that there was some sort of hierarchy within the family structure in the household, with one member being identified as wielding the most power. This result directs to Coleman's (1988) arguments that patriarchs who hold an extraordinarily large set of obligations in hierarchically structured family settings, also posses more social capital on which they can draw. This meant that the family structure within the Mara River Basin, allowed for a single individual to shoulder more responsibility within the network. This therefore meant that the head of the household was in a position to get the other family members to do his/her bidding. This could be considered as important for adapting to the climate crisis because if the head of the family provided the necessary direction, the entire household would be obligated to follow.

The study also looked at the issue of exchange amongst the family members as an indicator of the presence of social capital. As a basic unit of society, the family usually provides an opportunity for physical, emotional and financial exchange. When posed with the question of whom they would enlist to care for their homestead during travel, 55.2% of the respondents said they would entrust an older child or a close relative outside the household to undertake this responsibility. This was buttressed by the results that out of all the dependents within the households, a total of 33.1%, were above 18 years of age (Table 9) and therefore, as corroborated by information from the FGDs, were often left in charge of younger siblings and households during periods of absence by the household heads. The FGDs elicited sentiments that apart from formal organizations working in the area, family members provided a great deal of social, emotional and also physical support when required.

Table 9: Household Dependents Above 18 Years Old

	Frequency	Percentage
Dependents Below 18	495	66.9
Dependents 18-35	227	30.7
Dependents Above 35	16	2.4
Total	**740**	**100.0**

According to Peterson (1993), family networks exemplify arrangements of indiscriminate give-and take situations that require the cooperation of the family members. He posits that this cooperation is enriched by the existence of norms of trust and obligation and is generally geared towards the investment of the collective future welfare and prosperity of the institution. Peterson continues to argue that, an older child being expected to provide care for his/her siblings while they still live at home may exhibit this cooperation. This therefore meant that in households within the Mara River Basin where adaptation activities were initiated, this spirit of mutual exchange would contribute reduce the cost of implementation since each member of the family would cooperate to the same end.

The findings also revealed that the Mara River Basin community had a population that was generally educated, with 88.4% of the respondents having acquired basic education ranging from primary school to tertiary education. Only 11.6% of them had pre-primary or no education at all (Table 6). Given that the average years spent in school in Kenya, according to the Human Development Index are 11 (UNDP, 2015), the Mara River Basin community qualifies as relatively educated because 39.4% of the respondents were within and above this categorization. It has been argued that the amount of social capital within a family and existing obligations within society contribute to better educational achievements (Coleman, 1988). This argument is supported by results from a study conducted in Kagera region in Tanzania. That study established that both in the short and long run, the amount of social

capital within households, exemplified by the household size, the ratio of adults to children and the presence of two parents had an effect on the educational outcomes of children in that area. Ties with friends and neighbors further improved the children's chances of enrollment and retention in school (Bofota, 2013). Therefore going by the result that well over half of the Mara River Basin community had acquired basic reading and writing skills, it would suffice to presume that the amount of bonding social capital within the family could have contributed to this advancement in education. Thus, the high levels of people with formal education within the Mara River Basin could contribute to the enhancement of the community's adaptive capacity since it presents a platform for a better understanding of the climate crisis.

In a nutshell, this process of social capital generation and sustenance within families naturally links to social capital as a resource beyond the family set up. These relations between parent and child and social ties outside the family come together to create a dense social structure of norms, extensive trust and obligations within the general community (Coleman, 1990). Table 10 adopted from Winter (2000), attempts to show the connection between social capital within the family and the ways in which it links to the community. These arguments therefore suggested that since the Mara River Basin community exhibited strong ties within the family set up, it was likely to have strong community social capital.

Table 10: Nexus Between Family Social Capital and Community Social Capital

Social capital within family	Family social capital bridging to community	Mediating factors between family and community
Parent-child ratio	Higher levels of education	Locality type
	Less economic hardship	Crime rate
	Married with children	Ethnic homogeneity
		Income polarization
		Nature of local service provision

Note: Adopted from Winter (2000).

These results measuring social capital within the family structure also presented a different dimension from earlier studies carried out in the country. Those studies (Mwangi & Ouma, 2012; Kirori, Mariara & Ng'ang'a, 2011; Nyangena & Sterner, 2008), all measured the strength of household social capital by looking at the number of associations that household members belonged to. However, the study within the Mara River Basin presented a scenario where it was possible to establish the stock of social capital within a family by identifying social capital characteristics exhibited by members within a household.

The focus at this level of the study was bonding social capital within the natural, intimate, long-lasting and direct contacts within the household. Bonding social capital is defined by the interaction of three key elements, namely homogeneity, hierarchy and frequency. This refers to the number of common characteristics among members, a structure in which a single contact within a network holds an extraordinarily large set of obligations and finally the number of times the members of a network interact with each other respectively (Cassar, Crowley & Wydick 2007; Coleman 1988). The families within the Mara River Basin therefore by and large exhibited attributes of homogeneity, hierarchy and frequency in that, members of a household interacted with each other frequently and identified the hierarchical structure within the household. This in turn promoted reciprocity in their roles and obligations whilst providing an identity for the members. As a consequence, they would then be better placed to act collectively towards social problem and in this case specifically, the climate crisis.

The study then went ahead to establish social capital beyond the family set up. A contribution of the family towards social capital beyond the household was that more of the married people comprised the highest percentage (80%) of those who were members of community

associations (Table 11).

Table 11: Marital Status and Group Membership

	Group Membership	
Marital status	**Frequency**	**Percentage**
Married	213	80.0
Single	16	6.0
Separated	4	1.5
Divorced	6	2.3
Widow/ widower	27	10.2
Total	**266**	**100.0**

This according to Putnam (1996) is because married men and women are more trusting and belong to about 15 or 25 per cent more groups than comparable single men and women. The result from Mara River Basin therefore corresponded with Putnam's position. This result therefore indicated that the Mara River Basin was likely to have most of its residents subscribing to community associations, with members exhibiting trustworthy reputations. This would be instrumental for adaptation to climate change since it would facilitate the flow of information; foster 'group-think'; provide for informal monitoring and sanctioning of activities; and reduce costs of implementing activities. Thereby enhancing the overall community adaptive capacity to the climate crisis.

The research further sought to establish if the closeness and intimacy of informal networks characterized by bonding social capital, served as a conduit for the flow of information. The respondents were asked what their main source of information was and apart from the media, which stood at 56.1%, more than quarter of the respondents, 26.6%, considered their close networks, that is, relatives, friends and neighbors as a trusted source of information.

Table 12: Respondents' Main Source of Information

Main Source of Information	Frequency	Percentage
Friends/ neighbors	89	22.3
Relatives	17	4.3
Chief's Baraza	43	10.8
Church	26	6.5
Media	242	56.1

These results are similar to those from a study conducted in rural Uganda by Katungi, Edmeades, and Smale, (2006). Their study provides an insight into the linkages between social capital and informal information exchange among rural households in Uganda. The focus of their study was farmer-to-farmer informal information diffusion processes. Their findings indicated that the frequency of information was lower in female-headed households as compared to male-headed households, which disadvantaged them with regard to access to information. However, the study arrived at the conclusion that networks built around friendship were the most common channels of information with local associations serving as additional mechanisms of information exchange for those rural households. Therefore, just like in the Mara River Basin, strong ties served as a main source of information for the residents. However, it is important to note that the study in Uganda focused primarily on a homogenous community of farmers in the rural area and was also gender segregated. The situation in the Mara River Basin differs in that the population comprises of different communities, both rural and urban carrying out different kinds of occupational activities. The identification of strong ties as a source of climate change information led to a presumption that regular interaction took place between actors within the study area. This therefore implied that with regard to facilitating the flow of information on climate change, strong ties within the study area would be equally significant.

Further arguments advanced by Granovetter (1973), are that weak ties provide diversity in information, while strong ties create redundancy. The implication of these results for adaptation to climate change therefore was that the reliance of strong ties as a main source of information would mean that the Mara River Basin would reduce information asymmetry or cases where one party or individual has more or better information than others by generating common knowledge of the existing information. The lesser role played by weak ties and by extension formal information institutions at this point could have meant that the rate at which new information on climate change flowed into the community was low.

Conclusively, the connection between neighbors within the same locality, exemplified by the types of responsibilities accorded and the confidence in the acceptance of the information that emanates from them, further strengthened the argument for social capital within the Mara River Basin in relation to informal networks. This foundation of social capital influences the ability of the community members to control the behavior of individuals and groups in the community and instigate social organization towards resolution of common problems. Again here, the focus remains on the benefit that bonding social capital would have for the community with regard to the climate change phenomenon and its effects.

4.2.1.2 Formal Networks

Formal networks comprise of social ties that exist within the context of a formal organization with elements like by-laws, regular meetings, minutes of meetings. This encompasses membership to groups and associations and also relations with other institutions and government bodies. On group membership, the study indicated that 68.9% of the respondents subscribed to the membership of one or more community associations. These included: women's groups, youth groups, church/prayer groups and welfare groups.

Table 13: Group Typologies per Location

Location		Women Group	Youth Group	Church Group	Welfare Group	Merry go Round	Others	Total
Chemaner	Count	1	3	1	3	3	0	**11**
	% Row	9.1	27.3	9.1	27.3	27.3	0.0	**100.0**
Enelerai	Count	11	2	3	17	2	6	**41**
	% Row	26.8	4.9	7.3	41.5	4.9	14.6	**100.0**
Illmotiok	Count	8	15	1	21	8	6	**59**
	% Row	13.6	25.4	1.7	35.6	13.6	10.2	**100.0**
Kiplabotwa	Count	10	9	2	12	7	11	**51**
	% Row	19.6	17.6	3.9	23.5	13.7	21.6	**100.0**
Kipreres	Count	13	7	3	14	2	2	**41**
	% Row	31.7	17.1	7.3	34.1	4.9	4.9	**100.0**
Mulot	Count	14	9	6	22	5	7	**63**
	% Row	22.2	14.3	9.5	34.9	7.9	11.1	**100.0**
Total	**Count**	**57**	**45**	**16**	**89**	**27**	**32**	**266**
	% Row	**21.4**	**16.9**	**6.0**	**33.5**	**10.2**	**12.0**	**100.0**

According to Carter and Barret, (2006) and the World Bank, (2015) the prevalence of such informal associations are in many African countries is an indication of the existing social inequalities. This, they argue is because women and other marginalized groups still do not have equal access to property and resources as their male counterparts and these groups provide an opportunity for them to access resources that they otherwise might be excluded from. The implication of the formation of these community associations for climate change is that they would in the same manner provide avenues for these groups to be able to leverage resources that could be channeled towards adaptation activities. They would also serve to better connect households to local resources and collective action, determine flows of external support to different social groups, and link local populations to national interventions towards climate change adaptation.

The activities undertaken by these groups ranged from savings and loans mobilization, which was a specialty of 81.5%; undertaking income generating activities, providing social support

and taking part in community activities like environmental conservation. This was a multiple response question that recorded more than one result per respondent (Table 14).

Table 14: Community Association Group Activities

Group Activity	Frequency	Percentage
Savings and loans mobilization	326	81.5
Income generating activities	138	34.5
Provide social support	120	30
Environmental management	36	9

These results mirrored the situation in Malawi where savings groups attempted to increase access to financial resources by forming groups of people who could pool their savings in order to have a source of lending funds. Here, community methods of saving, such as rotating savings and credit associations also known as ROSCAs, provided an opportunity to save (Innovations for Poverty Action, 2011). These activities were undertaken in a bid to improve social inclusion, economic and social capability, a term, which Sen (1997), describes as an ability to participate in social activities as part of life in the community in an attempt to create a sense of belonging. The notion of communal pooling as implied by the savings and loans activities undertaken by the community association within the Mara River Basin could serve to enhance to community's adaptive capacity in response to climate change. This is because adaptation responses involving joint ownership and sharing of wealth, labor, or incomes across households, or mobilization of resources held collectively during times of scarcity further strengthen resilience in the face of climate change. Further, from an environmental perspective, resource pooling has the ability to generate competences in the collection and distribution of scientific and technical information regarding climatic changes.

The community associations within the Mara River Basin also exhibited network homophily, in that members of these groups had certain similar characteristics that bound them together,

for instance age or gender (Tables 15 and 16). For example, an examination of the percentage of respondents defined as youth (between ages 18 to 35), found that 88.5% of them subscribed to a youth group. This was similarly observed in the assessment of gender and group type whereby 75.8% of the female respondents belonged to women groups.

Table 15: Youth Group Membership By Age

Age Group	Frequency	% Within Youth Group
18- 25	14	26.9
26-35	32	61.5
Above 35	6	11.5
Total	**52**	**100**

Table 16: Women Group Membership By Gender

Gender	Frequency	% Within Women's Group
Male	16	24.2
Female	50	75.8
Total	**66**	**100**

This relates to Feld's (1981), argument of choice homophily that, individuals actually prefer homophilous ties especially in instances where the social structure presents opportunities for such homogeneous interactions. McPherson, Smith-Lovin and Cook, (2001), further this argument by stating that ties between people who are non-similar are more difficult to maintain while homogeneous ties have the advantage of geographic proximity, family relations and structural similarities within social systems that support contexts in which homophilous relations form. The implication of this homogeneity in associations within the Mara River Basin was that it worked to promote even more localized adaptation to climate change. This is because climate change vulnerability presents differently to different

segments of the population. Therefore homogeneity in this sense may contribute to different social units developing adaptation strategies that correspond to their levels of vulnerability.

The presence of formal networks within the Mara River Basin was also reinforced by views presented during the Focus Group Discussion, held with residents of the area. Through the use of a Venn diagram, the participants of the FGDs were able to outline the associations, groups and institutions that were present in the area. These were networks that they were either part of or had linkages with. The sizes of the circles in the diagram was directly proportional to the significance of the network in terms of resources that the participants were able to access by being part of said network (Figure 8). This brought to fore Lin's (2001), definition of social capital which emphasized the issue of resources that can either be accessed or mobilized by being part of a network.

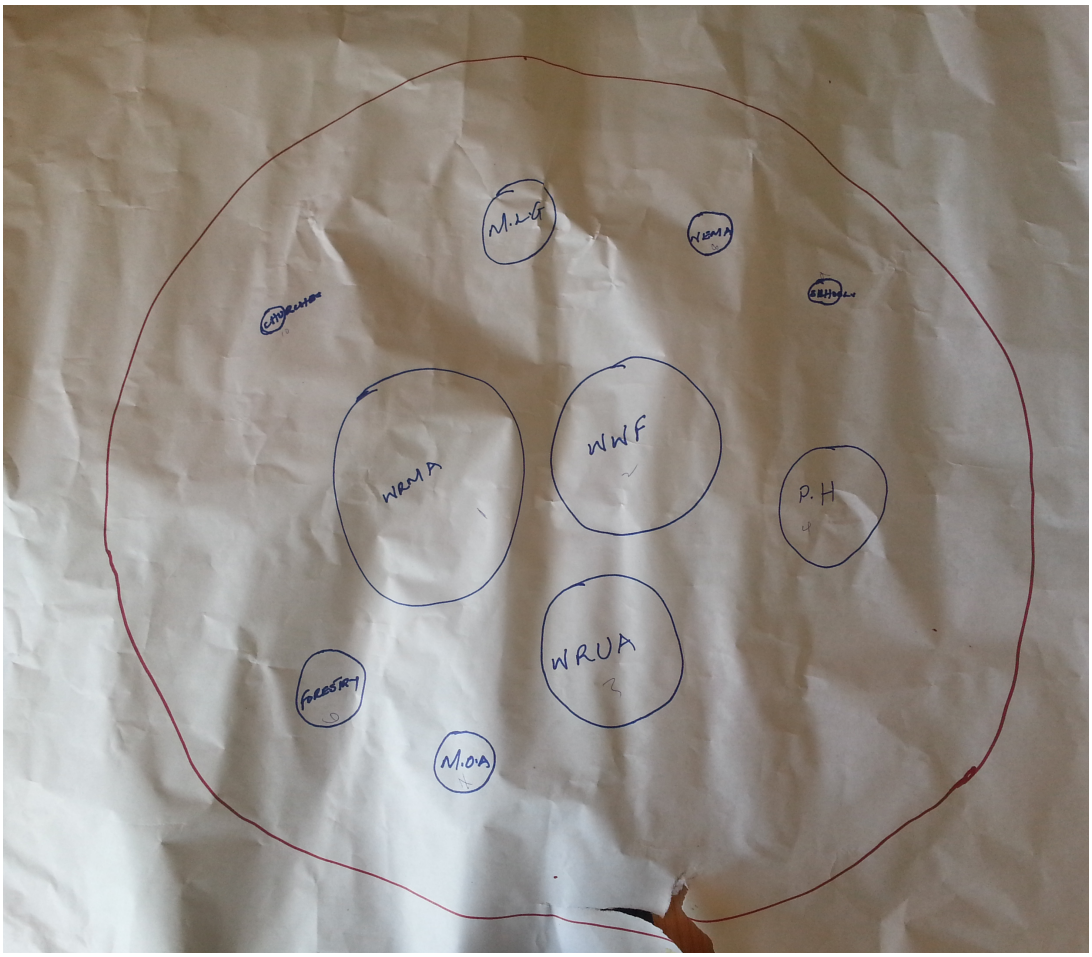

Figure 8: Venn Diagram of Community Associations.

According to the participants of the FGD, WRMA was an organization whose impact was well felt because it was responsible for the initiation of WUAs. It was also a major funder of some of the activities undertaken by these WUAs and had constant interaction with the community in a bid to ensure that the by-laws in the management of water resources were adhered to. WWF was another organization that was important to the community because it was at the helm in the development of the Sub-Catchment Management Program, which further built the capacity of the community members to implement different activities. It was an organization that was also concerned with improving the livelihoods of the people and had

thus initiated income-generating activities for the groups it worked with. This was in the form of exotic breeds of cows and goats. Third in the hierarchy were the WRUAs. According to the participants, the formation of these organizations enabled them to plan and procure funding for the implementation of their different activities.

The groups also provided manpower for the activities they were undertaking within their locality. Other organizations mentioned included schools and churches, which apart from providing education for children and spiritual nourishment respectively, were also identified as sources of manpower during major tree planting and environmental clean up days. The rest of the organizations mentioned included: the public health department which was identified for creating awareness on diseases; Ministry of Local Government which was assisting in environmental clean ups; Department of Forestry for provision of seedlings and training on how to manage trees species; Ministry of Agriculture which helped in controlling soil erosion and NEMA which was responsible for the enforcement of the Environmental Management Act. All these organizations were identified as working with the community of Mara River Basin in their different capacities and creating different levels of impacts.

Bhattarai and Hammig (2001) buttressed these results in the findings of their studies conducted in Africa, Latin America and Asia to analyze how income growth influenced the quality of the environment. Their argument was from the perspective that institutions contribute to the efficiency and growth of economies and are thus bound to influence environmental quality. They established that in Latin America and Africa, improvements by institutions that empowered citizens in different ways ultimately reduced the pressure on the environmental resources and led to better conservation. Similarly, the results from the Mara River Basin exhibited different organizations, symbolizing linking social capital, that were

able to build the capacity of the residents through providing information and diversifying their income. This was expected to reduce some of the anthropogenic causes of climate change that contributed to environmental degradation while at the same time reducing the vulnerability of the community with regard to climate change impacts.

The discussions further revealed a different kind of group structure that offered multi-level interaction amongst different kinds of groups. The Mara River water users association (MRWUA) typified this kind of arrangement. Information availed by the MRWUA office indicated that this was an umbrella group that comprised of 33 sub-catchment groups from Nyangores, Mara and Amala (Figure 9). The board membership was made up of representatives from the different sub-groups. MRWUA was mainly concerned with undertaking environmental conservation activities but also had a component of income generating activities. Apart from bringing together community members from across the Mara River Basin, the group also had vertical relations with other partners that were not within the community, for instance, Water Resources Management Authority, which was a government body and World Wide Fund for Nature, an international non-governmental organization. Within itself, through its different activities, MRWUA was able to make it possible for its members to pool resources together and have access to resources they would otherwise not have had as individuals while at the same time using its leverage as a group to enable the group rope in resources from outside the community boundaries.

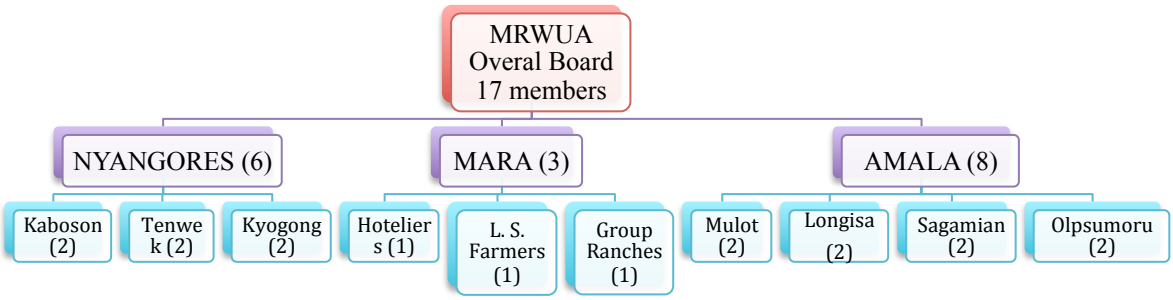

Figure 9: Mara River Water Users Association Networks. Source MRWUA Office

These results from the Mara River Basin contradict Olson's (1965) perspective on collective action. Olson who propagated the Collective Action Theory argues that collective action by large groups is difficult if not impossible to achieve even in instances where the actors have common interests. His position is that the cost of organizing collective action grows as the group size increases. He further argues that individuals in large groups gain less from successful collective action than their counterparts in small groups- these issues according to him reduce the likelihood of collective action within large groups. The results from the Mara River Basin instead presented a situation where linking and bridging social capital between community groups, government agencies and non-governmental organizations created a platform for the community to gain in terms of information, technical back-stopping and finances. All these were geared towards enhancing the community's adaptive capacity by facilitating collective action across the vast expanse of the Mara River Basin.

OH, Labianca, and Chung (2006), advance a different view from Olson in that, they summarize the link between these associations and social capital as structures that enable actors to access resources within the group just by being a member but also allowing the

group as a whole to mobilize resources that maybe available in the community but outside the boundaries of the group. As indicated by the results, the residents of Mara River Basin were able to use these formal networks within their community to access and mobilize resources to improve their living conditions. As it emerged, these networks also presented opportunities for them to address community problems that might have been perceived as greater than one individual could surmount and may therefore have required communal intervention. The results present efforts towards remedying the climate change situation through environmental management activities, like the implementation of the Environmental Management Act (EMCA), the preservation of water resources as proposed by the Water Act and the Forests Act. These were made possible or eased by the linking ties presented by these formal networks. As revealed earlier in the institutional ranking exercise through the Venn Diagram, participants of the FGDs expressed the sentiments that, by organizing themselves in these groups, the residents of Mara River Basin made it possible for the non-governmental agencies and various government authorities to build their capacity financially and technically through trainings, to enhance their capability of tackling the environmentally related problems.

4.2.2 Cognitive Social Capital

Cognitive social capital refers to resources in society that enable members to generate shared meanings and interpretation of their surroundings. This section therefore looked at some of these resources and the resultant norms that enabled members of the Mara River Community to cultivate and maintain social capital.

As noted in social capital theory, trust is a facet of social capital. According to Rousseau, Sitkin, Burt, and Camerer (1998), trust is purposefully accepting to be vulnerable based upon optimism in the intentions of another person's actions. The study sought to establish instances

of trust within the Mara River Basin community to further buttress the argument for the existence of social capital.

A likert scale analysis was done to establish perceptions of trust amongst the community members. The respondents were asked to identify a number on a scale of 1 to 10, with 10 being the strongest level of trust, who would they trust to deliver on a promise and why. Trust amongst kin was strong as 65% of the respondents gave a score of 6 and above to family members/ relatives. They felt that these would be the people most likely to deliver on a promise with the phrase "blood is thicker than water" coming up frequently. Friends/neighbours and church leaders scored 32% and 21% respectively. The worst performing category was that of politicians who only scored 4% (Table 17). Most people felt that the politicians only made promises during the election period after which they disappeared from the limelight.

Table 17: Level of Trustworthiness in Study Area

Who trust to deliver on promise		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Family	Frequency	3	14	28	33	59	78	83	45	39	9	**391**
member/Relative	%	1	4	7	8	15	20	21	12	10	2	**100**
Church Leader	Frequency	12	22	86	91	99	28	18	15	12	8	**391**
	%	3	6	22	23	25	7	5	4	3	2	**100**
Neighbor/Friend	Frequency	11	17	57	83	98	49	29	22	17	8	**391**
	%	3	4	15	21	25	12	7	6	5	2	**100**
Politician	Frequency	83	97	124	42	29	13	2	1	0	0	**391**
	%	21	25	32	11	7	3	1	0	0	0	**100**

This result was further strengthened by the opinion held by 55.2% of respondents who had earlier expressed confidence in family members' ability to take care of their homestead during periods of travel. This exhibition of trust amongst kin is supported by Cook, Levi and Hardin (2009) whose argument is that even within family members and dense networks trust

is key and dependent on the context and kinds of tasks the other person is trusted to perform.

The existence of groups and associations within the Mara River Basin was another indicator of the presence of trust. One of the most common activities undertaken by most (81.5%) of the groups was savings and loans mobilization. This is an activity that requires members to contribute a stipulated amount of money. This money is usually kept in a bank account, with the officials as signatories or in cash box usually in the possession of the group treasurer. The pooled resource is then available for members who require loans or is at the end of an agreed period, usually the end of the year, shared out amongst the members. Hugh, (2002) states that this Village Savings and Loans Association model was pioneered by CARE International and has since been adopted by other development agencies and associations. Hugh continues to argue that trust is fundamental for this process to function effectively.

First and foremost, the group members entrust the group officials who are the custodians of their money not to misappropriate the funds in any way. Second, the group members themselves have to be trustworthy and also trust that all members will make their contributions as required and that those who are loaned the money in times of need will not default on repayment. These findings are supported by Harding's (2005), view that associations by nature are dependent on trust. He posits that the parties involved in these kinds of relationships play the roles of truster and trustee. This ensures that the potential gains are realized and the association continues to function.

The presence of trust at different levels within the Mara River Basin indicated the potential that this facet of social capital held for climate change adaptation within the study area. Adaptation processes especially in developing countries require that actors depend on each other for information, manpower and finances. Trust therefore becomes critical because it

enables actors have confidence that everyone will hold up their end of the bargain and act according to set sanctions and without the extra cost of constant monitoring.

Security, whether at individual or community level is an important pre-requisite of development. Achievement of development objectives in any given society relies on the use of human potential and provision of a wide variety of choices and this is adversely affected by individual/community insecurity. Therefore, the need for security is considered priority for many societies (Narayan-Parker & Patel, 2000). This research sought to find out how secure the residents of the study area felt by establishing the frequency of petty crimes in the area. In general, a substantial percentage of the population (52.5%) felt that their community was pretty safe and experienced relatively low levels of crime (Table 18). This was partly attributed to high levels of trust within the community and respect for other people's property.

Table 18: Incidences of Petty Crime in Study Area

Incidence of Crime	Frequency	Percentage
Occasional	210	52.5
Often	120	30.0
Very frequent	70	17.5

The low levels of petty crime were a proxy towards bonding social capital since the argument is that communities with high levels of social capital enjoy improved security. According to the World Bank (1998), this is because shared values and norms can reduce or keep low the level of community violence. People who have informal relations with their neighbours can look out for each other and 'police' their neighbourhoods, what is commonly referred to as 'eye on the streets'. In addition, inter-family social capital provides support networks for family members overwhelmed by such stressors as poverty and unemployment and therefore they do not resort to crime as a source of livelihood. This argument is buttressed by Moser &

Holland (1997), who carried out a study in Dakar, Senegal and came up with the findings that where people live in very close quarters with few locks or alarms, social capital is a crucial security system and that informal justice systems are developed within these kinds of setups as a response to the lack of law and order.

As discussed earlier, climate change does not feature prominently in the policy agendas of many developing countries due to competing priorities, security being one of them. The results within the Mara River Basin indicated that social capital embedded in the community enabled the residents of the basin to enjoy relative security. Consequently, this implied that issues regarding climate change and how to respond to it could therefore feature in development discussions within the study area.

The survey results alluded to earlier revealed that 68.9% of the Mara river basin community members interviewed subscribed to group membership of some sort. The reasons for joining these groups were varied but overall being part of a group lowered certain transaction costs and accorded members exclusive benefits. For instance, 59% joined the groups because they expected some sort of financial or social support. When asked to elaborate, the respondents elucidated that, apart from the strength that comes from being a member of a group, during difficult times like funerals and sickness, other members of the group would step in to ease the financial burden by making contributions towards the cause. At the same time, the fact that they were able to visit the bereaved or sick, offered some sort of emotional support. This reiteration according to Sethi and Somanathan (2003), can give rise to the development of behavior that demonstrates mutual exchange features. This implies that, for instance, when a group member is bereaved the other members contribute towards the funeral expenses; this kind of reciprocal behavior becomes the norm and further reinforces social capital. This

exhibition of mutual exchange facilitated by the existence of social capital presents an advantage for climate change adaptation within the Mara River Basin. Adaptation to climate change is not an overnight process and it may take several years and even decades before successful adaptation is reported in different contexts. This therefore requires that actors involved in the process mutually exchange ideas, information and best practices that might expedite the process.

These results show how structural social capital within the Mara River Basin has contributed to the cultivation of cognitive social capital, which in turn serves to further sustain the existing ties. In other words, being part of a network, formal or informal, had given rise to norms of trust and reciprocity, which ensured the strength and continuation of those same bonds. According Krackhardt's (1992), argument, strong ties constitute a base of trust that removes impediments and obstructions and act as a safety net in times of adversity. Thus, since the residents of the basin exhibited connectivity amongst themselves at different levels and this connections had given rise to feelings of trust and reciprocity, the expectation was therefore that when faced with hardships like what the climate change crisis presents to society, they would one, be able to think and act in a collective manner, thereby reducing the costs of implementation; two, act individually but with the interests of the general community at heart; or three, that the presence of these networks would in some way act as a safety net and provide relief from the noted effects of climate change.

4.3 Social Capital and Climate Change Understanding in the Mara River Basin.

Social capital has been argued to comprise a valuable source of information benefits in that, who you know affects what you know (Lesser, 2000). Therefore the role that social capital plays in the social construct of climate change is critical not only to the community itself but also to policy makers because it provides a basis for the analysis of local and global social contexts within which policy makers and scholars operate (Crona, Wutich, Brewis & Gartin 2013). This section of the study sought to establish how social capital influenced the understanding of climate change amongst community members within the Mara River Basin.

4.3.1 The Role of Community Networks in Understanding Climate Change.

This section of the study sought to establish the role played by network ties within the Mara River Basin community in shaping the local's understanding of climate change. Shared values and trust have been found to be fundamental in the transmission and acceptance of information from external sources and thus influencing what information about a phenomenon is attended to and ignored (Schwartz, 1994; Weber, 2010).

The study revealed that residents of the basin had knowledge about climate change with 96.2% reporting to have heard about the phenomenon. The electronic media was a popular source of information on climate change at 94.6%. However, close intimate networks also played a very vital role in relaying the information about climate change with 70.8% of the respondents reporting to have received the knowledge from a close friend, relative or child. This was a multiple response question, which sought to establish all the avenues available to the community members with regard to accessing information on climate change.

Table 19: Source of Information on Climate Change

Source of Information on Climate Change	Frequency	Percentage
Radio	323	80.8
TV	55	13.8
Computer/internet	21	5.3
Local newspapers	80	20.0
Church	48	12.0
NGOs	19	4.8
Meetings	112	28
Street theatre/drama	3	0.8
Posters	10	2.5
People (family, friends, kids)	283	70.8
In school	8	2.3
Other (from the old men during my circumcision, observed)	12	2.7
None	3	0.8

The survey results pointed to close networks as a major contributor to information about climate change and as such were responsible for the Mara people's understanding of the phenomenon (Table 19). First, issues of proximity, which are important for ease of information exchange, come into play here. Family members, close relatives and friends who present as intimate and informal ties, presuppose constant interaction and thus facilitated flow of information on climate change. This was illustrated for example by the roster provided by each of the respondents, which indicated household members who interacted on a daily basis. Second, timing of delivering the information was also critical in this case because it ensured availability of personal contacts to provide information sooner than it became available to people without such contacts. This, according to social capital scholars may in this case increase the value of the information (Granovetter, 1973; Ibarra, 1992; Krackhardt, 1992; Lesser, 2000).

A third important component attributed to learning about climate change is trust. Generally, people are bound to be more attentive and incorporate information into their decisions and actions, if the information emanates from a trusted source (Weber, 2010). Respondents within the Mara River Basin held their close networks in high esteem and interactions at this level elicited trust from the actors. This trust had been exhibited by responsibilities like trusting family and friends to take care of the homestead while travelling (55.2%), and a further 65% trusting their kin more than any other person to deliver on their promises (Table 17). This provided an explanation to the acknowledgement of close ties as a source of information on climate change. This is because if the respondents did not trust these ties, they would not take into account information emanating from them and thus would not list them as a source of information on climate change.

Fourth was the issue of shared language and codes which not only allows for debate and exchange of information but also influences understanding by providing a common frame of reference for observing and interpreting the environment (Berger & Luckman, 1966; Pondy & Mitroff, 1979). The study made a presumption that being members of the same kinship, family members had the same operational language. In this case bonding social capital, which is more inward looking and focuses on homogeneity played a role in the facilitation of information flow on climate change by making it possible for members of the household to understand the nuances of climate change in a language they were comfortable with.

To begin with, these results indicate a different scenario from what Dybenko (2009) proposes regarding climate change communication in Africa. She advances the argument that new technologies and applications could be a sustainable approach to help Africans cope with the climate crisis. Her argument is pegged on the fact that Africa has the fastest growing mobile

subscription in the world. She further argues that there have been applications that have been developed to assist different segments of the populace such as those geared at helping farmers increase their yield and income. She continues to acknowledge the expansion of broadband connectivity and site the example of Kenya's launch of two high-powered communication lines to increase connectivity. However, the picture indicated by the results of the study in the Mara River Basin, was that only 5.3% of the respondents used the Internet to access information on climate change. This presupposes that relying on modern phone applications and the Internet to communicate climate change in the study area might not be as productive as projected. The situation in the study area indicated that there was still preference for human interaction and networks, which consequently led to transfer of information from one person to another about climate change.

Group membership of different sorts may also influence understandings of climate change (Weber, 2010). From the study findings, 44.8% attested to have heard about climate change from a group meeting. This was either the voluntary association that they subscribed to (28%), a church gathering (12%) or a meeting called by a partner organization (4.8%), (Table 19). Being part of a formal group, enables information flow and knowledge transfer in four ways. First, through the diversity of the network ties, there is efficient screening and distribution of information to persons who are members who are able to use said information (Burt, 1992). The more diverse the network contacts, the richer the information benefits since useful contacts established in different places provide an opportunity for the actors to access from different perspectives.

On that score with regard to the study area, people who were members of voluntary associations were able to access climate change information from the different members who were drawn from different parts of the locations. In the case of Mara River WUA for instance, information from the chairperson of the group revealed that the membership of the organization comprised of 33 sub-catchment member groups from all over the basin and drawn from different occupational backgrounds. The organogram of the umbrella group (Fig 9) was made up of small-scale farmers, large-scale farmers, ranchers, hoteliers and other water users. This meant that all these actors brought different bits and pieces of information to the table, which other members could then be able to access.

Further information provided by the Mara River WUA office confirmed that, these groups worked with other stakeholders and partners like Water Resources Management Authority which is a government body, World Wide Fund for Nature, Ministry of Agriculture, National Environmental Management Authority, County Councils, Municipal Councils and German Technical Cooperation (GTZ). All these partners held different conferences and capacity building forums where members of WRUA were expected to be in attendance and during some of these forums climate change within the basin was a topic of discussion. This finding is in agreement with Burt's, (1992) and Granovetter's, (1973), position that weak networks provide more information benefits as opposed to strong networks, which provide less diverse information and are limited in terms of their geographical position.

Second, these voluntary associations and groups were bound by norms, which enabled their day-to-day operations. Discussions with members of the community during the FGD held in the MRBMI office indicated that, the 33 sub-catchment groups found within the expanse of the basin, had a constitution, which directed their modus operandi. This constitution included

information like how much subscription members should pay to become a member and the administration of the office following formal registration. According to Coleman (1990), norms represent an agreement within a social system, that actors' actions are controlled not by themselves, but by others within the system. These norms therefore bind members of these organizations or associations and apart from fostering cooperation; they provide a basis for creation of knowledge by facilitating exchange processes and access to information (Kramer & Goldman, 1995; Putnam, 1993). Towards this end, the discussions in the FGD further indicated that the various sub-catchment groups had offices or information centers where members would then go to access information on the various issues and activities. The MRBMI project officer affirmed the presence of communal points for access and dissemination of information by the various sub-catchment groups and attested that this made it easy especially when urgent information needed to be passed to the group members. Therefore, in order for the groups within the Basin to achieve their different objectives, openness and teamwork were norms that would be critical in fostering a 'groupthink' mentality and this called for open disclosure of information.

Third, is the aspect of obligations. Being part of a voluntary organization represents a personal commitment to be able to undertake or take part in the group's activities in the future. This therefore acts as motivation for members of a group to share knowledge about phenomenon if they are expected to undertake in activities in future. An interview with the Water officer in Bomet County, established that the sub-catchment groups in collaboration with Mara River WUA were in the process of implementing the Water Act 2002 and Environment Management and Coordination Act 1999 as stipulated in the government policy. In order to achieve this, there were capacity building sessions supported by partners like WWF, NEMA and WRMA, which were aimed at providing information to the members of

these groups about activities set in these policy documents. In this process, he established that information about the different aspects of climate change was discussed and passed on to members of the community.

Finally, is the aspect of identifying with the group. As a process of enrolling into these formal organizations found within the Mara River Basin, members are expected to pay a subscription fee before they are formally recognized as members of the group. The Mara River WUA for instance has a paid up membership of over 1000 members across the basin. This process of enrolment and undertaking of the various group activities present an opportunity for members to identify with the different formal networks and therefore feel free to share information with other members. The study for instance found that the groups within the basin undertook different activities together including savings and loans mobilization, income generating activities, provision of social support and environmental management According to Kramer, Marilynn and Benjamin (1996), identifying with a group enables an actor to see themselves as one with other actors within the group and this heightens concern for group activities and outcomes. As a result this feeling of togetherness influences the anticipation of value to be achieved through exchange of information with other actors within the network.

The results exhibiting group membership and its influence are similar to those of a study carried out in Togo. Gadédjisso-Tossou (2015) sought to assess farmers' perceptions and adaptation to climate change in the maritime, plateau and savannah regions of Togo. The objective of this study was to enhance policy towards tackling the challenges climate change posed to the farmers in the study area. The results established that along with other social attributes, being member of farmers' association influenced positively farmers' perception of changes in the climate of the study area. However, the study did not focus primarily on the

social capital attributes that those associations possessed that enabled them to influence the farmers' perceptions, which the study in the Mara River Basin did.

Conclusively, the study recognizes the role played by social capital within the Mara River basin to facilitate understanding of the climate change phenomenon at bonding and bridging levels. Further, the results from the study in the Mara River basin clearly itemize the characteristics of social capital at bonding and bridging level that augment the flow of information amongst actors. This provides a more in-depth perspective to the character of social capital than highlighted in studies highlighted earlier that have acknowledged its role in facilitating climate change information flow.

Thus far, the study has argued that social capital provides a foundation for the exchange of information and knowledge about climate change and consequently influences how people understand the phenomenon within the Mara River Basin. The consequent sections address results regarding these understandings about climate change with in relation to the causes, impacts and possible adaptation mechanisms.

4.3.2 Climate Change as Understood by Mara River Basin Community

This section explores the perspectives held by the residents of the basin with regard to climate change causes, impacts and known adaptation mechanisms. Climate scholars have argued that Africa has the worst climate- observing system of any continent. This, they claim has further complicated the situation by contributing to a lack of reliable data and hence the presence of large knowledge gaps on African climate, manifestations of future climate change and variability for the region and the associated negative impacts of climate change (Washington, Harrison, & Conway, 2004; Washington et.al, 2006).

4.3.2.1 Causes of Climate Change within the Mara River Basin

The study sought to establish what the people of the Mara River Basin understood as the cause of this phenomenon that majority of them (96.2%), had heard about. This question elicited multiple responses from the respondents of the household questionnaire surveys. Climate change was attributed to deforestation by 76.8% of the respondents interviewed (Table 20).

Table 20: Causes of Climate Change By Study Population

Perceived Causes of Climate Change	Frequency	Percentage
Deforestation	307	76.8
Burning fossil fuels	235	58
Poor agricultural practices (overstocking, too much fertilizers, tree planting, encroaching on riparian way leaves)	62	15.2
Don't know	39	9.8
Curse/punishment from god	21	4.3

This was supported by views from the Focus Group Discussion following a Trends and Timelines Analysis done by participants. The discussion revealed that in the 1970s, there was a lot of forest coverage in the basin, which started significantly changing with a rise in population in the 1980s. This decade saw the felling of more and more trees for domestic purposes, selling of firewood and also to free land for agricultural purposes. This was magnified by charcoal burning as an economic activity, which took root in the 1990s and peaked in the turn of the millennium. The discussion further revealed that, due to the increase in population, the towns grew and so there was substantial demand for timber for building and fencing purposes.

Another 58% of the respondents blamed the practice of burning fossil fuels for the climate change crisis. According to discussions with the participants of the focus groups, in addition to the thriving charcoal business, which contributed immensely to burning of fossil fuels, the year 2000 also saw an increase in factories, which made the situation worse by burning petroleum and emitting the smoke into the atmosphere.

Table 21: Historical Trends and Timelines Analysis of Climate Related Issues in Study Area

Issue	1970s	1980s	1990s	2000s
Rainfall	Heavy rainfalls	Rainfall reduction	Little rainfall	Famine Floods
Forest Cover	Large areas under forest; Low soil erosion	Clearance of forest cover; Beginning of soil erosion	Selling of split Firewood; Started charcoal burning	Charcoal business increases; Selling of tree-posts and timber increases; Afforestation intensifies
Water	High quality and quantity of water	Water quantity reducing	Gully erosion increase	Sale of water increased; Farming through irrigation
Water borne Diseases	Little water borne diseases	Water quality becoming poor	Waterborne diseases increase	Livestock reduced
Landuse	Low population	Population increase	Farming increase; Use of chemical fertilizer increase.	Population high; Factories increase; Towns expand; Change to grade cattle.

A small percentage, 15.2% of the respondents within the Mara River Basin also attributed the problem of climate change to poor agricultural practices such as, overstocking of domestic animals, encroaching on riparian way leaves or the overuse of fertilizers. Interestingly, there were still a few people, 9.8% who despite having heard about climate change, had no idea what caused it and a further 4.3% who believed that it was a curse from God.

Two Key Informants who echoed similar sentiments supported these findings. They both agreed that over the years the increase in population had led to a massive expansion of towns and this apart from changing the settlement patterns had also increased agricultural activity. One went further to give a breakdown of the activities along the basin that might be contributing to the climate crisis. He mentioned that apart from a lot of illegal irrigation taking place, there was also pollution from agro chemicals. Information from the WWF office indicated that:

> Wheat farmers have gone overboard and started farming in areas that were originally not meant for wheat. To make it worse, wheat farming requires cutting down of trees to allow for mechanized farming.

These results were supported by studies by Malhi, Adu-Bredu, Asare, Lewis and Mayaux, (2013), that indicate that the African rainforest cover has been on a decline subject to deforestation and could increase climate variability and vulnerability of the region. This massive degradation of forest cover has been attributed to rapid population growth and subsequently cutting down of trees for fuel wood and to make room for cultivation land in countries like Ghana, Bukina Faso, and Cote D'Ivoire (FAO, 2010; Ouedraogo 2010; Pouliot, Treue, Obiri & Ouedraogo 2012). Similarly a study conducted in West Africa that established

that the growing of cocoa has led to extensive cutting down of trees and as a consequence become a major driver for climate change in the region (Francois, Götz & Kone, 2015).

These results on the causes of climate change as understood by the residents of the Mara River Basin imply that their main sources of information, which largely included their strong ties were effective. This was because the respondents seemed well aware of the anthropogenic drivers of climate change and were even able to relate it to their own circumstances and activities, which further highlighted the significance of context related research for climate change. It is also important to note that there were no responses that indicated the causes of climate change that are attributed to natural factors like changes in the sun's radiation and volcanic activity. What was significant however was that the study population was able to identify their contribution to the climate crisis, since anthropogenic emissions are responsible for the escalation of climate change.

4.3.2.2 Impacts of Climate Change within Mara River Basin

Results from the survey revealed that majority of the respondents believed that climate change would result in less rain (52%), more disease outbreaks (44.5%) and hotter temperatures (42.8%). This was in concurrence with arguments raised during group discussions (Table 21), that in the 1970s, the basin enjoyed heavy and regular rainfall patterns, which contributed to an abundance of water and consequently few incidences of water borne disease outbreaks. However, in the 80s, the amounts of rainfall started reducing ergo there were reductions in water available for both domestic and agricultural use. Consequently, there was a proliferation of waterborne diseases in the 1990s. However, 36.8% of respondents felt that climate change would lead to more intense rains and storms. Increased erosion was a concern for 28.8% of the respondents while 17.3% associated climate change

with loss of vegetative cover. Only 6.3% associated the damage of public utilities like roads and private investments such as houses with the climate crisis.

Key informants felt that certain activities within the basin were exacerbating the impacts of the climate change crisis. For instance, the Water Office alluded to the fact that illegal sourcing of water by hotels and ranchers had amplified the water shortages. Interestingly, the mention of floods as an impact of climate change was only in passing yet in 2010 through to 2015, flash floods caused a lot of damage within the basin and even saw sections of the roads in the lower part of the basin cut-off (ReliefWeb, 2015).

These results concur with documented scientific literature on climate change and its impacts on the African continent. The existing literature states that the African continent and more specifically East Africa will experience warmer temperatures, increased precipitation during wet months, reduced rainfall during already dry months, which might lead to drought and increased desertification. Climate change is also expected to aggravate the occurrence and intensity of future disease outbreaks and may increase the spread of diseases in some areas, amongst an array of other effects (Hulme, Doherty, Ngara, New, & Lister, 2001; IPCC, 2007).

Therefore, from these results it was clear that the residents of the Mara River Basin were reporting impacts of climate change that had already been projected for the African continent. However, in as much as these perceived impacts may reflect a regional and global picture of what is already experienced or projected as a result of climate change, the study population seemed to be reporting on effects that were related to their locality and that influenced their daily activities.

4.3.2.3 Climate Change Adaptation Measures as Understood by the Mara River Basin Community

Adaptation to climate change impacts is a process that requires contextualization and is dependent on knowledge by local communities (Adger & Kelly,1999; Locatelli, 2011). The study therefore sought to establish if the community of the Mara River basin was aware of what adaptation options were available to them and not necessarily the adaptation measures that were actually practiced; these would be explored in a later section.

In response to their understanding about the causes of climate change, the biggest percentage of respondents interviewed at household level felt that planting, not cutting and looking after trees would be a suitable way to adapt to the effects of climate change. These responses stood at 65.3%, 51.8% and 34% respectively. Building gabions to prevent erosion and not cultivating along the riverbanks both stood at 12% each. Some respondents felt powerless in responding to the climate crisis as 5.3% felt that people should do nothing or pray to God for divine intervention.

Table 22: Adaptation Measures Known to Respondents

Perceived Adaptation Mechanisms	Frequency	Percentage
Must plant trees/bushes	261	65.3
Must avoid cutting down the trees	207	51.8
Must look after trees/bushes	136	34
How to build gabions to prevent erosion	48	12
Should not cultivate on the river banks	48	12
Everyone needs to cooperate in adapting to CC	22	5.5
Pray	16	4.0
Must avoid burning bushes or waste	0	0
Nothing	5	1.3

These results on the understanding of climate change adaptation was interestingly similar to those of a study carried out by Read, Bostrom, Morgan, Fischoff and Smutts, (1994), in Point Park, Pennsylvania. Even though this particular study was done in a developed country and

therefore a different context, 177 people were interviewed and the results showed that the respondents rated reforestation as one of the most effective strategies for responding to global climate change. Therefore, this implies that generally local population whether in developing or developed contexts are still not clear on the demarcation between adaptation and mitigation.

From the results and discussion on the perceived adaptation activities, it was important to note that there was a misconception of what adaptation was vis-à-vis mitigation. The study population mainly reported activities that were geared at mitigating climate change by focusing on responding to the causes and thus intending to reduce carbon emissions. Adaptation activities should have focused on how the community was altering its activities to manage the experienced and projected effects of climate change. This should have included activities to reduce their vulnerability as a community as well as improve their resilience. This therefore meant that the respondents of the Mara River Basin were still not clear on the distinction between climate change adaptation and mitigation.

In conclusion, social capital played a role in the understanding of the climate change phenomenon amongst the people of the Mara River Basin. This was facilitated by the existence of both informal and formal networks that eased the flow of information from one actor to another. It was key to note that locals did not report climate change in terms of mean temperatures or precipitation. However, they highlighted mostly the inter-annual changes or variations in the frequency or intensity of various events that were of importance to them as a community. This indicated that community knowledge on climate change was not based on statistical figures but rather on things they could observe or experience.

Another issue worth noting was that the presence and active involvement of formal institutions created an interaction between the institutions' objectives and the understandings of the locals. This means that information passed around to locals from institutions governing certain resources tended to shape their understanding of the climate change crisis. This suggests that the outcomes were mainly crosscutting findings emerging from the underlying social structures that the different sectors had in common as opposed to being sectoral in nature. That is, being a predominantly agricultural community, the expectation would be that the understanding of climate change causes, impacts and possible adaptation strategies would be approached from an agricultural perspective; this was however not the case. The understanding of the Mara River Basin's local residents was more inclined towards a general picture that encompassed the basin as a whole and also towards the ideals of the partner organizations working in the area. These were organizations like WWF, WRMA and NEMA that seemed to have a strong presence in the area. As a consequence, regardless of whether deforestation in this particular region could be causally linked to global climate change or not, political pressures at the national level have been seen to mount defining forest protection as a priority area in efforts to address climate change. This has been evidenced by the government's efforts to restore the Mau forest complex, which is the origin of the Mara River Basin.

4.4 The Contribution of Social Capital towards Climate Change Adaptation Initiatives within the Mara River Basin

Having established the existence of social capital and how it influences the Mara people's perception of climate change, the study then sought to establish if there were any activities geared towards climate change adaptation, that were evidence of collective action or that could have been instigated by social capital. However, the study sought to first distinguish between coping mechanisms, which have been reported throughout the history of mankind, and adaptation, which tends to be more thought out and long-term.

4.4.1 Coping with, *Vis a Vis* Adapting to Climate Change Within the Mara River Basin

The research began by assessing if there were any general coping mechanisms undertaken by the community members during the last extreme weather event experienced in the area. The year that most respondents (25.5%) could recall was 2005 and they reported to have experienced prolonged drought within the Mara River Basin. The other years with extreme events that were remembered also included, 2012, 2008 and 2007, reported by 17.3%. 12.8% and 10.0% of the respondents (Figure 10). These subsequent years according to the respondents were years that experienced intense rains, which resulted in flooding and disease outbreaks. This result was backed up by information from Key Informants. The Ministry of Water and Irrigation office confirmed that in 2005, the basin experienced a prolonged period of drought, which led to major food insecurity in the area. This was followed by years of intense and erratic rainfall patterns and according to the Public Health Office and Ministry of Agriculture Office, floods brought about by these rains especially in 2011/2012 also referred to as La Nina, led to the proliferation of waterborne diseases for both humans and crops.

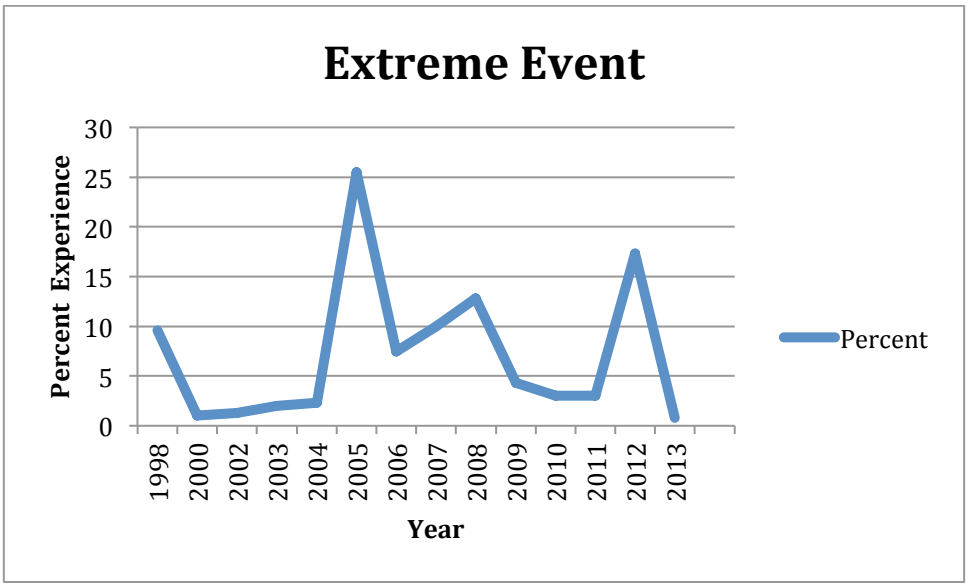

Figure 10: Experiences of Extreme Weather Events in Study Area.

During these periods 80% of the respondents reported that they stayed put during the extreme weather event but initiated activities that helped them cope with the prevailing situation. In the year 2005, the activities reported included, buying tanks for harvesting rain water, walking longer distances in search of water and food and planting alternative drought resistant crops. Some of the respondents (20%), reported to have migrated to other areas during the extreme event in search of pasture for their livestock. In the subsequent extreme weather event years of 2007, 2008 and 2012, the respondents reported planting cover crops to reduce the rate of soil erosion and temporary movement in search of safer grounds due to flooding. These results are similar to those of other studies that have identified an increase in the incidence of drought in regions like Africa as part of potentially serious climatic changes that may lead to many millions of refugees by the middle of next century (Ayres & Walter, 1991; Mohamoud, Kaloga & Kreft, 2014; Trolldalen, Birkeland, Borgen & Scott, 1992).

The research aimed at distinguishing coping mechanisms from adaptation measures because adjustment of livelihoods for instance, movement due to harsh climatic conditions is not new in the history of mankind. Coping mechanisms tend to be a short-term way of responding to an experienced effect and not new to man. (Integrated Regional Information Networks, 2015; Wood, 1995). Therefore, form this result it was clear that residents within the study area had indeed initiated certain measures to cope with extremities in weather conditions. These were however not to be mistaken for adaptation since they were not long term adjustments but rather just temporary reactions to events as they happened.

According to the Narok County Planning Office, during floods other community members were called upon to provide food, blankets and other basics for those who had been displaced. However, given the fact that these coping strategies were not well thought through, a re-occurrence of the extreme event may require the involvement of the same social networks and these may strain existing ties. It is therefore based on these concerns that the United Nations argues that coping strategies of today are likely to undermine opportunities for adaptation in the future, through unplanned and unstrategic use of resources, including social networks (UN, 2015). Hence, societies should not build future adaptation on most of today's coping strategies. An analysis done by CARE International, through brainstorming sessions with groups of development practitioners in Ghana, Niger and Nepal, provides the distinct differences with regard to coping and adaptation mechanisms (Table 23).

Table 23: Differences Between Coping Mechanisms and Adaptation Strategies

Coping mechanisms	Adaptation strategies
Short-term and immediate	Practices and results are sustained
Oriented towards survival	Oriented towards longer-term livelihood security
Not continuous	A continuous process
Motivated by crisis; reactive	Involves planning
Often degrades the resource base	Uses resources efficiently and sustainably
Prompted by a lack of alternatives	Focused on finding alternatives
	Combines old and new strategies and knowledge

Note: Retrieved from CARE International (2009)

The study as a follow up therefore, sought to establish adaptation mechanisms employed by community members within the Mara River Basin. This was pre-empted by a brief explanation of what adaptation means so that the respondents could give responses away from the normal coping mechanisms highlighted by earlier responses. The results revealed that apart from attending meetings organized by various governmental and non-governmental organizations, which 73.1% of them had done, 65.3% of the respondents said that they had initiated tree planting, while 51.8% felt that taking care of existing trees and avoiding cutting them down at will was a good measure of adapting to the climate crisis. Initiating different agricultural mechanisms was another adaptation measure that the residents of the basin had resorted to with 12% of them building gabions to reduce erosion and another 12% stopping cultivation on riparian way leaves.

These results are similar to those established by CARE International (2009), in Dakoro, Niger, while undertaking an evaluation of community based adaptation measures. Their evaluation established that reforestation or avoided deforestation; sustainable land management and the restoration of degraded lands were adaptation strategies employed by

the community in the face of climate change uncertainty. Their study revealed that the number of trees maintained or planted amount to 64,165 for the four communities. This is an average of 75 trees per household. Similarly, a total of 1,575 hectares of degraded lands have been restored. This represents an average of 1.85 hectares per household. These all resulted in improved production and livelihood for the members of that community.

From these result it was therefore clear that the residents of Mara River Basin were initiating some sort of community based adaptation responses to climate change which was more long term and thought through as opposed to the coping mechanisms which were knee jerk reactions to extreme events. These results also exhibit a difference in terms of what the Mara River Basin community perceived as adaptation and activities that were actually undertaken towards adaptation. The activities that were implemented by the study population appeared to be more holistic (not sectorial in nature) and mainly targeted towards responding to the climate change effects as opposed to mitigating the causes.

To have a better understanding of how social capital instigated these different activities, this study split the scope of social capital into three: macro level represented by linking social capital; meso level represented by bridging social capital and micro level represented by bonding social capital.

4.4.2 Linking Social Capital and Climate Change Adaptation in the Mara River Basin

At the macro level, the study explored the role of non-governmental and governmental institutions working within the basin and how these kinds of networks prompted the community's adaptation to climate change. As earlier noted, 73.1% of the respondents reported that as part of their adaptation measures, they attended meetings, forums and seminars where issues relating to climate change were discussed. These meetings were part of

the community capacity building sessions organized by NGOs, primarily World Wide Fund for nature (WWF) and arms of government ministries like National Environmental Management Authority (NEMA), Department of Forestry and Water Resource Management Authority (WRMA). These were also organizations that members of the community identified during Focus Group Discussion as important to them with regard to climate change issues within the basin. The study focused on two organizations that had been widely mentioned as having the biggest impact, namely, WRMA and WWF.

Information from the Ministry of Water office revealed that, as part of rolling out government policies on management of natural resources, the government ministries charged with these responsibilities as part of their mandate, carry out capacity building of groups. WRMA for instance, which is the government body that deals with the management of water resources, initiated the formation of Water Users Associations (WUA), which are also referred to as Catchment Management Groups (CMGs). The Key Informants within the Bomet Water Office and the Mara River WUA Project Office indicated that these groups were then trained on a wide range of activities geared towards the management of the basin, which they were then facilitated to implement. These activities included: soil and water conservation for areas that were prone to soil erosion during the rainy seasons like the upper catchment regions; riverbank protection and demarcation to prevent encroachment on the riparian way leaves; agro-forestry and on-farm woodlots, where farmers were encouraged to intercrop their plants with trees or have sections of their farms dedicated to tree planting; setting up of tree nurseries at individual, group and school levels to provide ready seedlings for afforestation purposes; introduction of alternative energy technologies to reduce fossil fuel burning; waste management and water pollution control and the inception of income generating activities to reduce illegal logging activities (Figure 12a, 12b).

Information from the FGDs further indicated that WWF was one of the important organizations in the area because apart from helping community groups to initiate income generating activities, they also held regular capacity building sessions on issues related to climate change and environmental managements. For purposes of achieving its objectives and reducing duplication of activities, WWF avoided forming new community structures but opted to use the existing WUAs. Key Informant Interview with the Project Management of the Mara River Basin Management Initiative (MRBMI), revealed that as part of its response to the manmade climate crisis the Norwegian Agency for Development Cooperation (NORAD) and WWF-Norway initiated the MRBMI, which was managed by WWF-ESAPRO from 2003. Its intentions were more specifically to address issues regarding water resource degradation and depletion in the Mara Basin and impacts on the globally important Mara-Serengeti ecosystem.

These results are similar to those of a study conducted in Bangladesh by Gogoi, Dupar and Jones (2014). Their study revealed the critical link played by external organizations in community-based adaptation. They state as follows:

> "Bangladesh has been labeled the 'adaptation capital of the world' by climate adaptation specialists. It has been a pioneer in CBA and has a flourishing NGO sector supporting pilot initiatives throughout the country. Eleven international NGOs, together with local and international research partners, have joined forces to carry out a long-term research programme called 'Action Research on CBA in Bangladesh' (ARCAB). Many of the partners involved in ARCAB have also been organizing or supporting annual international conferences on CBA, which often take place in Bangladesh. There is evidence that a 'community of practice' on CBA has emerged as a result." (p5)

The findings from the Mara River Basin indicated that linking social capital played a critical role in enabling the members of the Mara River Basin community reduce their vulnerability towards climate change by increasing awareness and initiating different projects- some geared toward improving the economic status of the community. Generally, this was aimed at enhancing the overall adaptive capacity of the community. The study then went ahead to assess attributes of these organizations that may have contributed to their influence on the study population.

The study looked at the issue of network centrality with regards to WWF and WRMA to enable assessment of their influence on the community. Centrality is defined as the degree to which an individual actor connects other actors who would otherwise not be linked (Burt, 1992). An actor who sits between many other actors in the network is said to have a high intermediary centrality, which implies that the actor could act as a link between these others who usually are otherwise disconnected sets of actors who are by defined by bridging ties. Consequently, this high level of centrality grants the actor the ability to influence the flow of resources between others, and it also provides a diversity of resources provided by the bridging ties (Burt, 2004; Granovetter, 1973). An excerpt from the final evaluation report done of the WWF-MRBMI project provides an illustration of the degree of centrality occupied by WWF Kenya country office, which is one of the organizations in question with regard to its influence on the population of Mara River Basin community in piloting community based adaptation activities. (Figure 12a; 12b).

With regard to WRMA, possessing a combined effect of network position (degree centrality) and formal level of authority as exhibited in Figure 11 may have resulted in the ready uptake of adaptation initiatives proposed. This position is supported by a study carried out by Bodin

and Crona (2008) of a rural fishing village in Kenya, which also illustrated this interplay between structural positions and formal authority. They identified two nodes of power, represented by the government official, who was formally recognized by the state but who only occupied a marginally influential position in the village networks; and the other was represented by the village chairman, who had no official power with regard to the state but was firmly embedded and very central in the village networks and therefore highly influential in all village matters. Thus, the village as a whole was highly dependent on how and if these two individuals, whose influence was based on very different grounds, chose to collaborate on village matters. The effectiveness of these two key institutions, WWF and WRMA, working within the Mara River Basin with regard to implementation of climate change adaptation strategies can therefore be linked to network centrality.

A report of an evaluation of the MRBMI (Onyando, Agol & Onyango, 2013) summarized these links between WWF, WRMA and other stakeholders within the river basin. An illustration of these links is shown in Figure 11.

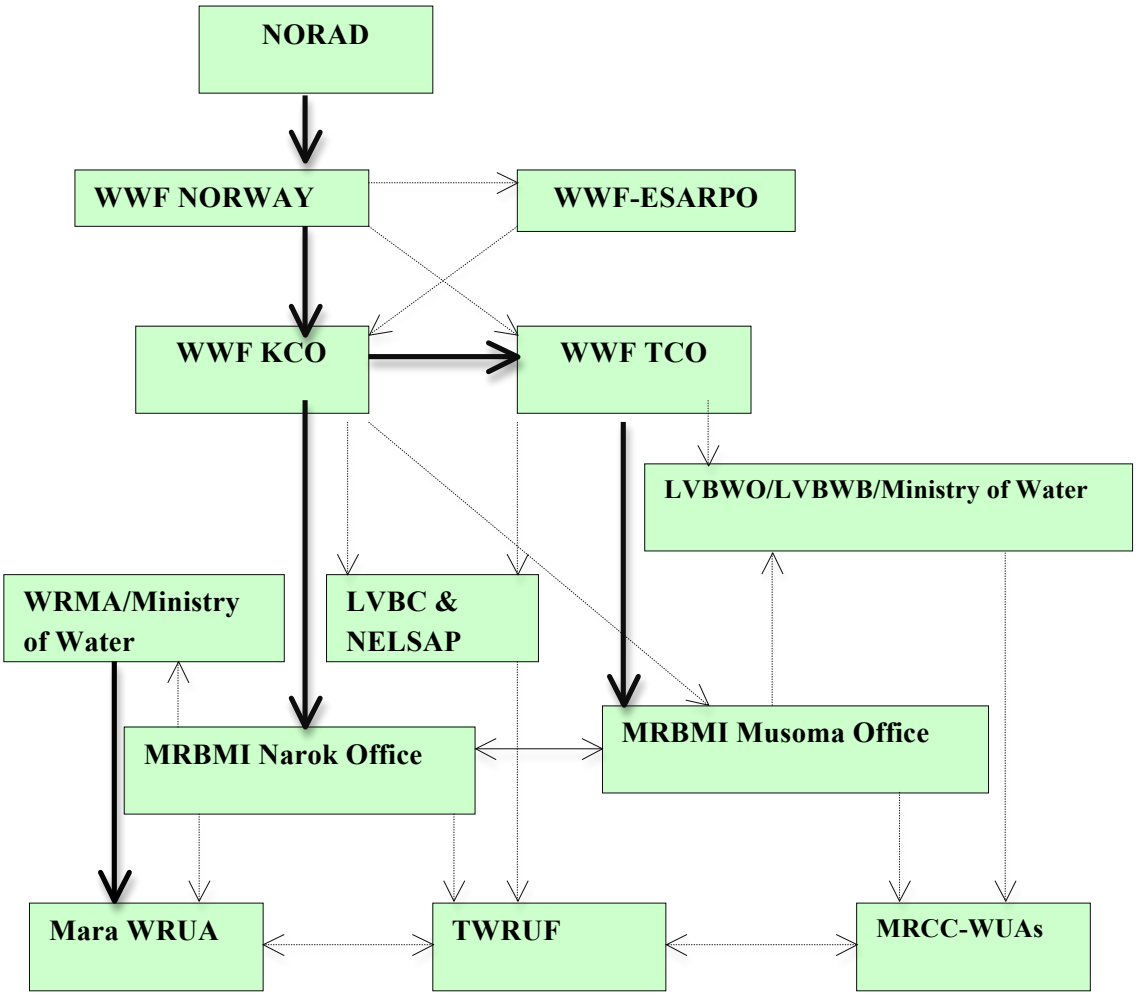

Figure 11: MRBMI Partners and Stakeholders. Retrieved from Onyando, Agol and Onyango (2013)

The figure exhibits both horizontal and vertical ties between organizations in the study area and this exemplified the vastness of resources that the community could access. The inter-connectedness of these organizations gave the Mara River Basin an advantage over communities that did not enjoy the synergistic relationship presented by social capital and were thus more limited in terms of their access to resources. This is in line with the notion that linking social capital connects actors or members of a community with people or institutions, which are not part of the same community but are in positions of power due to their political or financial predispositions. Linking social capital also includes vertical connections to formal institutions (Mayoux, 2001; Woolcock, 2001).

In the case of this study therefore, what Granovetter (1983) refers to as 'weak ties', lived up to their expectation by providing diverse pools of resources that the residents of Mara River Basin could draw from with regard to climate change adaptation. These external connections may be responsible for the effectiveness of community associations that may have internal strength in terms of cohesion and willingness to cooperate (Uphoff, 1996). The results of the study exhibit that the Mara River Basin community had been able to execute collective action across the basin by utilizing linking social capital. The wide coverage and multilevel nature of the groups within the Mara River Basin had enabled the community to leverage a far wider range of resources than would have otherwise been available to them without the collaboration with these external bodies. This cooperation also provided a platform for the members to acquire more information and funding that enabled them practice adaptation activities that might have been insurmountable as a community on their own. Thus, reducing the financial costs related to implementation of adaptation activities.

4.4.3 Bridging Social Capital and Climate Change Adaptation in the Mara River Basin

The study considered the interconnections between actors through community associations as bridging social capital. It further sought to establish if this interconnectedness that brought together people across different social strata, had any effect on community adaptation to the climate crisis.

The study area spans over a geographical area that encompassed mainly two different ethnic groups; that is, the Kalenjins and the Maasais. Certain community groupings therefore brought together members of both ethnic groups and hence presented an opportunity for the creation or strengthening of bridging ties. A good example as revealed by a Key Informant Interview was the Mara River WUA (Figure 9), which comprised of membership of sub-

catchment groups from all over the basin. The interview with the group's management revealed that membership from Nyangores sub-catchment comprised of groups from Kaboson, Tenwek and Kyogong, which were predominantly Kalenjin; Amalo sub-catchment was represented by groups from Mulot, Longisa, Sagamian and Olposumoru and these were a mix of Kalenjin and Maasai; and Mara sub-catchment represented by hoteliers, large scale farmers and group ranches and these were mainly people of Maasai descent. The interview further informed that apart from various income generating activities, the Mara River WUA also had specific activities targeting climate change adaptation. The main activity towards this end was afforestation with the group having a fully operational tree nursery, which was used to produce seedlings for sale during community tree planting days and to individuals. As at the time of the interview, the group had also distributed water tanks for rainwater harvesting to 5 schools within Longisa and Mulot divisions of the Basin. This activity was meant to prevent the children from walking long distances in search of water during the prolonged periods of drought.

These finding was further strengthened by results from the survey, which indicated that community members had undertaken a number of activities to adapt to climate change as part of the community association initiatives. This was exhibited by the 52.8% of the respondents who had undertaken climate change adaptation activities as part of a group. During the FGDs, the participants further explained that group membership had motivated them to undertake activities that they had learnt during various trainings would enable them reduce the effects of already experienced and anticipated climate change. They used the common phrase "unity is strength" to explain that as groups they had been able to achieve much more than they had earlier been doing in their individual capacities. The issue of reduced cost of undertaking these activities also came up in that, when for example members pooled resources together to

start a tree nursery, the amount each member was expected to raise was lower than if the member was undertaking the initiative on their own. The same applied to purchasing tanks for rainwater harvesting; the cost was reduced when the members contributed and bought these as a group and distributed to the members in turns. According to the participants labor was also easily available because the members took turns to tend to the tree nurseries as opposed to if an individual was doing all the work on their own.

Study findings also indicated that group membership further enhanced the community's adaptive capacity by reducing vulnerability to the climate crisis. This was indicated by the result that 48.4% of the respondents had joined voluntary associations within the study area in a bid to improve the income and or standard of living.

Table 24: Reasons for Joining Voluntary Groups in Study Area

	Frequency	Percentage
Income/Std living	124	48.4
Social support/Belonging	70	27.3
Empowerment	27	10.5
Security/Peace	11	4.3
Resource pooling	11	4.3
Community Planting Trees	13	5.1
Total	**256**	**100.0**

These results were buttressed by findings form the FGDs. Discussions revolving around the Venn Diagram (Figure 8) that sought to validate the significance of formal institutions within the study area, highlighted that these groups had enabled the members increase their income. This was done through the initiation of income generating activities.

These results are also an indication of happenings within the region with an example of the Reducing Emissions from Deforestation and Forest Degradation (REDD). For instance, in Tanzania, REDD pilot projects have included components designed to support rural livelihoods in ways that reduce deforestation and forest degradation impacts. For example, income-generating activities (IGAs) are often developed to substitute activities based on unplanned and unsustainable forest harvesting (Norwegian Embassy in Tanzania, 2015). However, the projects in Tanzania seem to focus more on mitigation by specifically targeting the reduction of carbon emissions. The results in the Mara River Basin exhibit a more comprehensive approach whereby the community is undertaking activities that are responding to experienced and anticipated effects of climate change on their livelihoods, while at the same time contributing to mitigation. For example, the tree nurseries provide tree seedlings for reforestation whilst at the same time boosting the financial base of the group members.

Results from the survey revealed that residents of the Mara River Basin had mixed feelings about the climate change phenomena and how it affected their lives (Table 25).

Table 25: Sentiments on Climate Change in Study Area

Feelings	Frequency	Percentage
Fearful/ Afraid	167	39
Confused	67	17.6
Angry	24	6.1
Powerless	76	18.8
Hopeful	74	18.5

Further discussions during the FGDs revealed that the community members felt that being part of the existing groups gave them an opportunity to address the mixed feelings they had about the climate crisis. They held that the information they got from various forums and the opportunity to gather and discuss issues that may have been misconceived or considered

mystical by the community, gave them a push towards taking action before it was too late. There was a general consensus during the discussion held at the MRBMI office that they as community members held the key to reducing their vulnerability by undertaking activities to safeguard against the effects of the climate crisis. One of the participants expressed the following sentiments:

> ...as a community, we feel that our fear of this thing that we did not understand is fading. We are faced with the realization that climate change is as a result of our own activities and not a curse from God. So even though we still don't understand it fully, what we know has opened our eyes because apart from praying about it, we know that we can actually do something about it…take control. (Participant of FGD held at MRBMI office)

These results showing the uncertainty of the study population on the intricacies of climate change reflect concerns by certain scholars. Moser and Dilling (2010) for example express the concern that when experts tell lay audiences about the technical aspects of climate change, it is usually a one-way communication that does not allow the audiences to build a shared understanding of what exactly the problem is and what could be the possible options to approach the situation. Therefore a lack of proper understanding would explain the nonchalant way in which the public approach climate change issues and their lack of engagement.

The results from the Mara River Basin therefore indicate that bridging social capital, exemplified by membership in community associations, had provided an arena for community members to generate a clearer picture of climate change. Through community meetings, they were able to table their ideas on climate change and discuss any misconceptions they had, thereby emerging with a clearer picture and common knowledge on

how they contributed to the phenomenon, how it was affecting them and options that they had to respond. This enabled them to roll out possible options for adapting to climate crisis since they had developed a localized idea of climate change.

The Narok County Planning Office however indicated that one of challenges experienced in implementing activities towards climate change adaptation was the difficulty in attempts to unite the two communities. This arose from the existing bonds within each community and presented a scenario where each community wanted to be ahead of the pack and keep all the benefits accruing from the different projects. This was especially common along the borders like in Mulot and Longisa divisions. On the same breath he continued to inform that forums bringing together members of the community from across the entire basin, like MRWUA, presented a platform for addressing these issues and forging ahead. The results from this discussion were supported by arguments postulating the negativities of social capital that state that communities with strong ties, based on the close circle of family, clan, kinship, caste and ethnicity, create cleavages and closure, which sometimes create interlocking difficulties in their upward movement (Field, 2003; Portes & Landolt, 1996).

In this particular instance, bonding social capital generated by ethnic ties was indicated to have slowed down the gains leveraged by bridging social capital. That is, bridging social capital as it were and as exhibited by the MRWUA membership sought to elicit a “we” mentality to enable members of the Mara River Basin respond to the climate crisis. However, study residents along the border towns still reverted back into their ethnic cocoons and desired to dominate all the incentives resulting from the adaptation activities. Interestingly, the results also exhibited a complementary relationship between bonding a bridging social

capital. Bridging social capital was in this case used to address challenges that may have been presented by strong bonding ties.

These results showing the influence of bridging social capital towards climate change adaptation can be attributed to two things; norms of trust and reciprocity and the role of networks in the creation of generalized knowledge. According to Torsvik (2000), trust in itself is not a form of social capital but an outcome of the forms of social capital that leads to successful collective action. In the case of this study, the groups operating within the Mara River Basin have some sort of institutional rules that govern their operations whilst at the same time creating rewards or incentives for those who act accordingly. For instance, making donations towards purchase of tree seedlings or equipment for the tree nursery, contributing time towards the management of the groups projects and so on was an act of obliging to the rules of the associations. The existence of informal or formal rule that specified how persons who did not deliver on their end of the bargain would be penalized further ensured that members of the groups undertook the activities of the group as stipulated.

The issue of trust goes hand in hand with reciprocity, which Ostrom (1998) defines as an effort to identify the different actors involved in an activity, an assessment of the likelihood that others will be willing co-operators, making a decision to cooperate with others, while refusing to cooperate with those who do not reciprocate, and finally punishment of those who betray trust. According to Ostrom these are strategies that are involved in collective action situations and exhibit that trust is an integral part of reciprocity because an individual who abides by the norm of reciprocity is therefore considered trustworthy. In the case of Mara River Basin, the individuals who were members of these groups were willing co-operators in that, they had joined the groups on their own volition in an effort to improve their situation

either personally or as a society. This is indicated by the reason the respondents gave for joining these groups (Table 24). In this process, they were expected to cooperate with the groups' objectives and not betray the trust.

According to Vanderschraaf & Giacomo (2014), common knowledge is useful for communication or successful coordination of human behavior. When approaching an issue, individuals typically require mutual or common understandings or background knowledge. This is further supported by Uchwe's (1999) position that social networks influence a group's knowledge and thereby influences its ability to act collectively. However, just having common knowledge is not enough. According to Ishihara & Pascual (2013), this knowledge has to be diffused and shared amongst community members for collective action to take place. In the case of Mara River Basin, the community groups provided an opportunity for individuals to come together and have some common knowledge about the climate change phenomenon. Through their networks and interaction, this knowledge was then transmitted from person to person to ensure that members of the same group were on the same level of understanding. This in turn influenced their decision to take action collectively as evidenced by various activities within the river basin.

Thus, with these results, the study suggests that bridging social capital contributed to enhancing cooperation towards adaptation to climate change in this particular society. Apart from facilitating the flow of information on climate change, bridging ties were responsible for reducing the financial, physical and psychological costs of adapting to climate change. Additionally, the results brought to fore components of social capital embedded within voluntary community associations in the study area that enabled them to effectively facilitate collective action towards the climate crisis.

4.4.4 Bonding Social Capital and Climate Change Adaptation in the Mara River Basin

The study considered the functionality of bonding social capital and how the ties between people in similar situations (familial, friendly or neighborly), prompted actions towards adaptation to climate change within the Mara River Basin.

Results from the study indicated that 74.3% of the respondents who undertook activities towards adaptation as part of a group, were well aware that the various activities they were undertaking were meant to reduce the severity of the already experienced and anticipated effects of climate change (Table 26). This meant that they were able to comprehend exactly what adaptation entailed. It was also an indicator that their networks mentioned earlier as a source of information on climate change were successful in the transfer of information thus leading up to adaptation activities.

Table 25: Respondents Who Undertook Adaptation Activities to Reduce Severity of Climate Change

	Frequency	Percentage
Undertaking activities as Individual	18	24.3
Undertaking activities as a group	55	74.3
TOTAL	**74**	**100.0**

However, it was important to note the most of the activities implemented by said groups and group members were within their own locations. This was due to the fact that apart from umbrella groups that covered the entire basin, the community groups comprised of membership mainly from a specific geographical location within the study area.

Table 26: Respondents in Groups Within Study Locations

Location	Respondents within group	Percentage
Chemaner	11	4.1
Enelerai	41	15.4
Ilimotiok	59	22.2
Kiplabotwa	51	19.2
Kipreres	41	15.4
Mulot	63	23.7
Total	**266**	**100**

This presupposed homogeneity within these groups with regard to their physical location, ethnic background, kinship, friendship or neighborhood- and therefore bonding ties. Putnam (2000) refers to these kinds of ties as inward looking with a tendency to reinforce exclusive identities and homogeneous groups. This result was reinforced by information provided by the MRBMI office, which works hand in hand with the community catchment groups. The Project Office stated that despite the fact there were forums and activities that brought these CMGs together most of the group's activities were primarily undertaken within their specific locations (Figure 12a; 12b). The sentiments were that this provided an opportunity to create strong ownership of the projects and not necessarily create hostility. This was summed up using the following statement:

> ...after all, charity begins at home. These groups have to clean up their own backyards before they can be examples to other communities.

These results were similar to those of a study conducted of Kalahan forest in the Phillipines by Dahal and Adhikari (2008). The study found that high bonding social capital, which was mainly due to the indigenous and homogeneous character of the people living in the area led to high level cooperation in the successful management of forests through local community participation. In the case of Kalahan, the formal participatory organizational management

process, a traditional system of collective decision-making and involvement of tribal institutions backed up the high level of bonding relations among the people of the same ethnic origin.

The results thus imply that bonding social capital based on locality, allowed the Mara River Basin confront the impacts of climate change that they were experiencing. This ties provided them with forums to discuss, agree and implement practical solutions that were suitable for their locale. This also indicated that the residents were able to focus their adaptation strategies to reflect the specific challenges that climate change presented within their locations as opposed to the vast expanse of the Mara river Basin. This was also exhibited by the differences in the kinds of adaptation activities being implemented by the groups in different locations (Figure 12a; 12b). This further drew attention to the issue of localized adaptation as a response to experienced and anticipated effects of climate change.

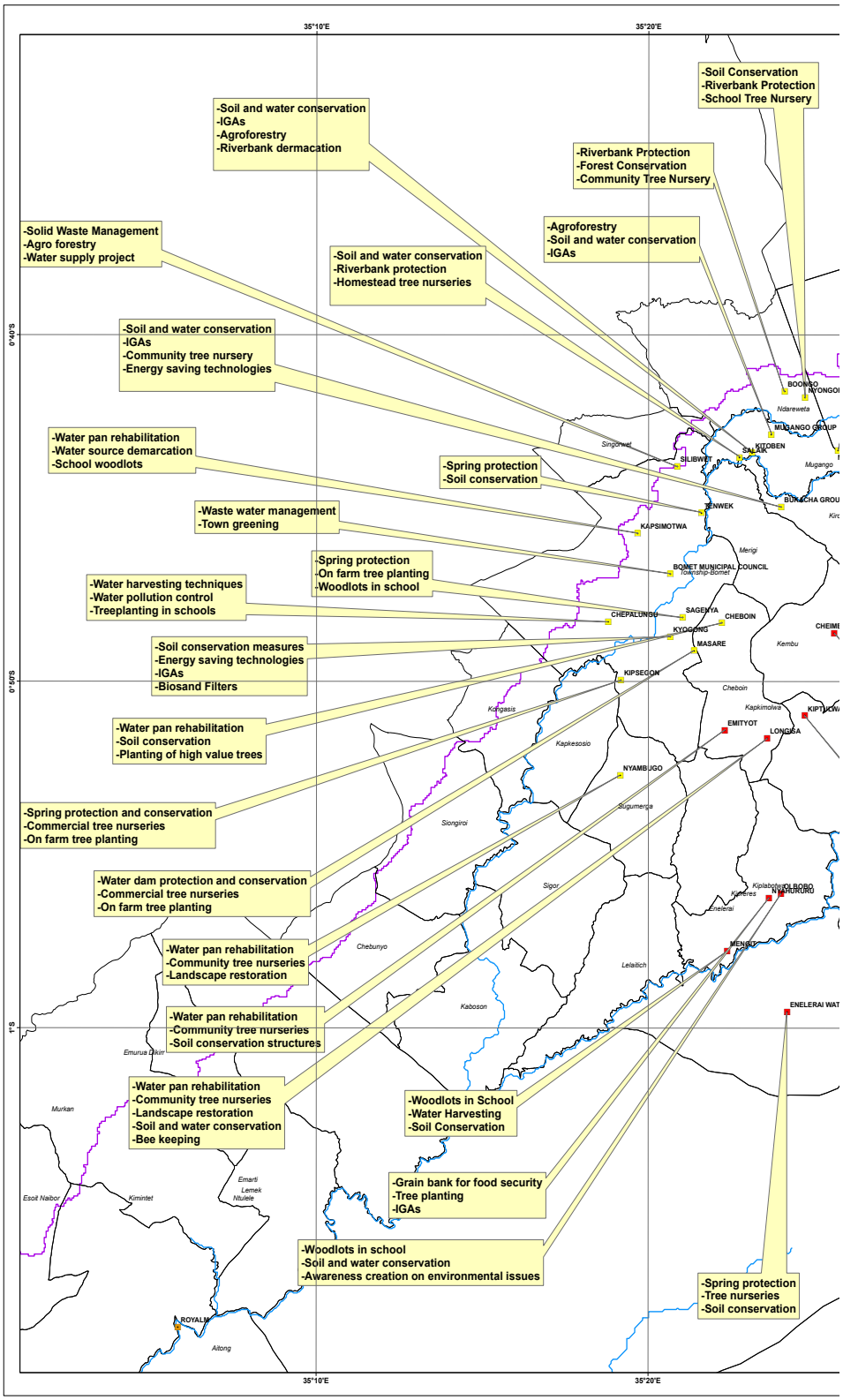

Figure 12a: Mara River Basin CMG Activities. Source: MRBMI Office

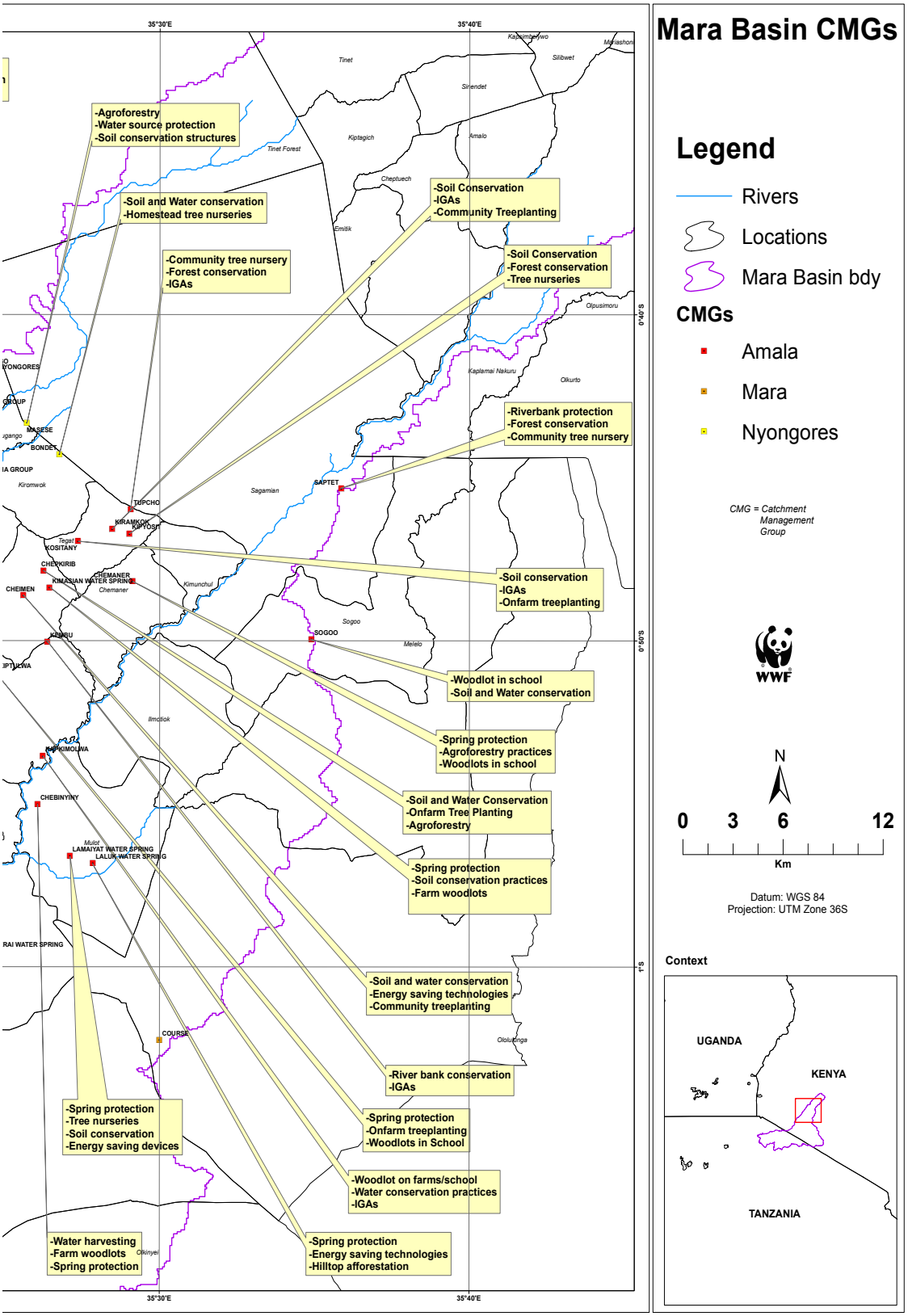

Figure 12b: Mara River Basin CMG Activities. Source: MRBMI Office

The study also established that 33.8% of the respondents had undertaken the initiatives not as part of a group, but as individuals. Out of these, the highest percentage (57%) performed these adaptation activities in order to preserve the environment for future generations (Figure13).

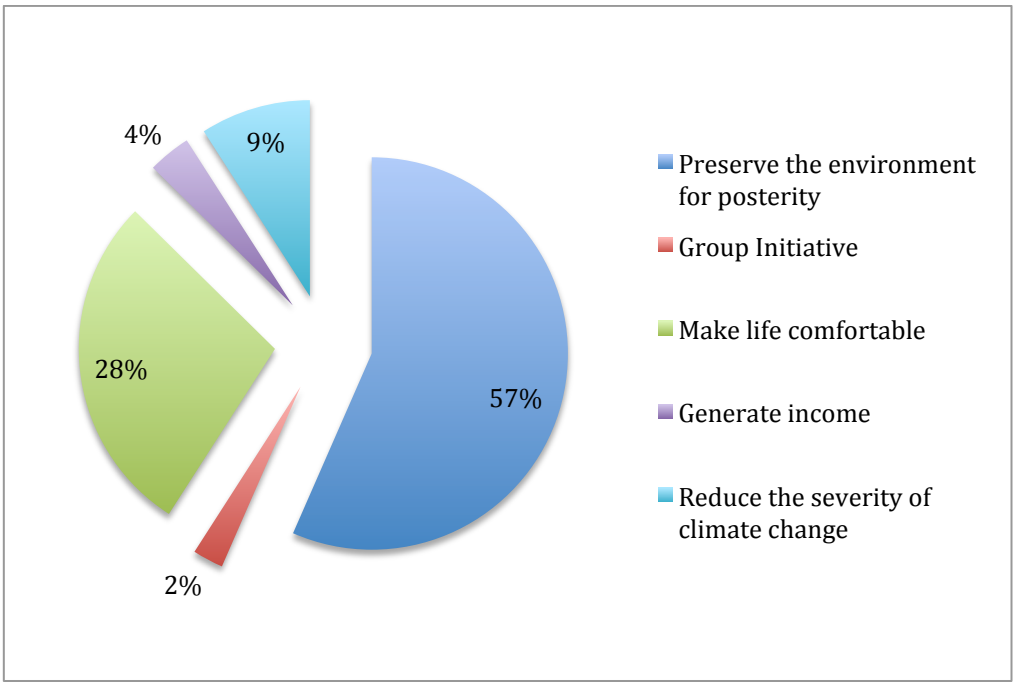

Figure 13: Reasons for Undertaking Climate Change Adaptation Activities in Study

This particular segment of the population did not at this juncture overtly exhibit characteristics of social capital, because they were primarily acting in their individual capacities. However, their main reason for undertaking the activities was a proxy indicator of social capital. According to OECD, (2001), amongst some of the effects of social capital that take a long time to appear include investment in children and future generations. They further argue that inadequate investment in posterity can be detrimental to general human well being. According to Pelling and High (2005), social capital provides actors with ways of

understanding the role of important social features that contribute toward building capacity for social collectives and individuals to respond to the climate change crisis. Therefore in this particular instance, the focus becomes the individual and how this facet of social capital enables them to participate in enhancing the community's adaptive capacity without necessarily being part of a group. This particular result from the study in the Mara River Basin indicates that this aspect of social capital would appeal to social recluses who would be interested in contributing to the community's climate change adaptation activities. This facet of social capital is however not replete in empirical data since most studies tend to focus on the significance of social intercourse that creates shared values and norms that result in collective action for public good.

Adger and Kelly (1999) argue that developing countries' vulnerability to climate change is usually enhanced by the lack of collective action to protect from extreme events. Combining and connecting multiple types of social capital, which cut across micro and macro levels, rather than attempting to increase one type alone, can be useful in resolving public problems and enhancing wellbeing (Pretty, 2002; Woolcock & Sweetser, 2002).

In conclusion therefore, the case of Mara River Basin, presented an interplay among the different types of social capital, cutting across the different levels of the community from micro to macro and vice versa. This study offered an opportunity to look at the different ways in which social capital can be functional in addressing the climate crisis and how to reduce vulnerability and enhance resilience by developing effective adaptation measures. From the study, it is clear that one type of social capital need not be detrimental to another but mutual interdependency can actually result in the strengthening and expansion of the different bonds, bridges and linkages in the community at large.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This section gives a summary of the findings of the study, the conclusions that were drawn from the findings and the recommendations that were subsequently made based on the results.

5.1 Summary of Findings

This study set out to establish if social capital made any contribution to climate change adaptation activities within the Mara River Basin. As a starting point, the study took stock of the dimensions of social capital that existed within the study area. Findings indicated that there was existence of both structural and cognitive dimensions of social capital. The study measured social capital within informal networks typified by familial, friendship and neighborly ties. The networks at this level exemplified characteristics of bonding social capital namely, homogeneity, hierarchy and frequency of interaction.

The study also took stock of capital within formal structures in the community. The first level explored distant ties of people living within the river basin represented by community associations. These bridging ties enabled community members to pool resources together, provide social support for each other and acquire information about salient issues within the community. The second level explored vertical ties between the community members and governmental and non-governmental organizations. The study results indicated that these linking ties enabled the Mara River Basin community leverage resources far beyond their borders in terms of technical support, donor funding and information on global issues.

With regard to cognitive social capital, the Mara River Basin community demonstrated the presence of trust and norms of reciprocity, exemplified by mutual exchanges within the different levels of the existing social structures. From the results, it was evident that close ties

also elicited higher levels of trust, which trickled into the community associations and community at large. These dimensions of social capital that were present within the Mara River Basin held a potential for improving the community's adaptive capacity by facilitating the flow of information and reducing the cost of implementing adaptation activities. These were explored in the subsequent sections.

The study then sought to establish what role these community networks played in enabling the Mara River Basin community understand climate change. The study established that strong ties (kinship, neighborly and friendship) were considered a major source of information on climate change. This was attributed to frequency of interaction, trust and shared language_ all attributes of bonding social capital that were exhibited by these networks. Community groups were also responsible for facilitating communication on climate change. This was attributed to the diversity of networks, norms, obligations and group mentality, which were facets of bridging social capital. These results also reflected a different position from that of climate communication experts who argue that investing in mobile phone applications might be the best way to improve climate change knowledge since very few of the respondents in the study area had made use of this particular technology to access information on climate change.

The results of the study further indicated that the networks were effective in facilitating the perception of the Mara River Basin's population on the climate phenomenon. This was because the population seemed to be well versed with the nuances of climate change. They reported inter-annual changes and variations in certain weather events that were specific to their locality. They also conveyed their knowledge on the possible causes and effects of climate change. These seemed congruent with what was reported and projected in literature

for the African continent and globally. However, it was also noted that the NGOs and governmental organizations working in the area seemed to skew the understanding on climate crisis to suit their objectives.

Finally, the study endeavored to establish if apart from facilitating the formation of common knowledge on climate change, social capital contributed to enhancing adaptation to climate change within the Mara River Basin in any other way. At linking social capital level, the findings revealed that the external organizations working in the study area, through capacity building sessions enhanced the skills of the study population with regard to the activities they were expected to carry out in response to climate change. Further, they reduced the vulnerability of the study population by helping them initiate income generating activities and providing financing for the implementation of adaptation activities. At bridging social capital level, membership in community associations, apart from increasing access to information on climate change also reduced financial, physical and social costs of implementing adaptation activities. This was primarily through pooling of financial resources and providing the required manpower during the implementation of group activities. At bonding level, the ties formed based on homogeneity of location enabled members to implement adaptation activities within their specific locations in a bid to reduce climate change severity within their locality. Preservation of the environment for posterity, a facet of social capital, also enabled individuals acting alone to contribute to the community's efforts in adapting to climate change.

5.2 Conclusions

Based on the findings from the data collected from the residents of Mara River Basin community, the study arrived at the following conclusions:

The Mara River Basin is well endowed with both structural and cognitive social capital at bonding, bridging and linking levels. This has eased the flow of information, participation in voluntary community activities, ensured a relatively secure community with reduced rates of petty crime and a generally effectively functioning community. The stock of social capital within the Mara River Basin held potential for successful adaptation to climate change, which was exhibited by subsequent concluding remarks.

The study also arrived at the conclusion that the existence of social capital through the different types of ties and networks found within the community influenced the understanding of climate change within the Mara River Basin. As a result the community members were able to demystify the nuances of climate change. It became evident to them that climate change was not an act of God but that they contributed to it through their day-to-day activities. This allowed them to take initial steps towards responding to climate change. Further, in the process of information passing from one actor to another, the residents of Mara River Basin were able to form common knowledge and reduce information asymmetry within the study area, as most of the respondents seemed well aware of what climate change was.

The study also came to the conclusion that the presence of social capital influenced the Mara River Basin's community efforts towards adapting to the climate crisis. This was first and foremost indicated by social capital's role in the understanding of the phenomenon. Through information flow within the various social structures and by the different social amplifiers, the community was able to construct climate change as a phenomenon that affected their lives

in one way or another and were therefore able to see the need to develop responsive strategies towards the crisis. Second, the assembling of community members into different kinds of voluntary associations made it possible for them to pool together resources required for the implementation of the different adaptation mechanisms. These resources included finances, manpower and general moral support or motivation to undertake said activities. This reduced the cost (financial, physical and psychological) of undertaking climate change adaptation activities within the study area and could have resulted in the success of the initiatives.

Finally, there was evidence that social capital gave the community members a "we" mentality in that they were thinking as a collective and therefore responded to climate change with the benefit of the community at large in mind. Apart from adaptation initiatives undertaken to benefit the group members, there were also activities that were undertaken in public spaces like tree planting and water harvesting in schools, water pan rehabilitation, riverbank conservation, spring protection, soil and water conservation. These activities were undertaken in spaces accessed by the general community of the Mara River Basin and therefore the whole community stood to benefit. Apart from these members of community who undertook adaptation communities as a collective, there were also some members of the community who undertook the initiatives individually but their motivation was directed towards the future well being of the community. This suggested that they identified with the community and therefore social capital could therefore have a hand in adaptation to climate change within the Mara River Basin community.

Consequently, the study concluded that both local and global interventions for facilitating local adaptation to climate change would be more likely to succeed if they built on existing knowledge and understandings of the phenomenon.

5.3 Recommendations

Following these conclusions, the study came up with the following recommendations:

First, climate change stakeholders and the respective county governments should strive to build the existing social capital at different levels in order to enhance communities' resilience, adaptive capacity and reduce their vulnerability to the crisis by having these social networks act as safety nets.

Second, policy makers, advisors and climate change stakeholders need to take into account local understanding of the climate change phenomena which provides an opportunity for context specific planning with regard to decentralized adaptation to climate change responses, which ensures the overall success of adaptation strategies.

Third, the state and other climate change stakeholders need to consider the role that social capital as a resource plays in reducing financial, human and psychological costs of adapting to climate change and as such include it in formal discourse aimed at developing strategies for adaptation to climate change.

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APPENDICES

Appendix I. Survey Questionnaire

Title of Research: Social Capital for Adaptation to climate change in the Mara River Basin, Kenya.

Principal Investigator: Lillian Atieno Omondi

Phone Number:

Email address: lilomondi@gmail.com

Supervisor: Dr. Mary Aswan Ochieng'

Phone Number:

Email Address: maryaswan@yahoo.co.uk

Hallo Sir/Madam,

You have been sampled as one of the respondents for this research. The purpose of this study is to establish what the residents of this area have done to adjust their lives in order to respond to the climate change crisis. The study also aims at finding out if different kinds of networks within the community help the residents to make these adjustments.

You will be asked to answer a series of questions while I record the responses. There are no risks in participating in this research beyond those experienced in everyday life. Some of the questions are of a personal nature and might cause discomfort e.g. marital status.

The estimated time required to complete the study questions is 45 minutes. Your responses will only be used for research purposes and will under no circumstances be traced back to you.

You have a right to ask questions and if you have any concerns please feel free to contact Lillian Omondi at 0721366834. If you feel this study has harmed you or you just have further questions about your rights as a research participant, you can also contact:

Maseno University Ethics Review Committee (MUERC),
Directorate of Research, Publications and Consultancies
Maseno University,
P.O. Box, Private Bag,
Maseno.
Tel: 057 351 622 EXT 3050

Your decision to participate in this research is voluntary. You can stop any time or decide not to answer any questions that you do not want to answer.

Thank you.

Respondent's Signature ---------- Date ----------

Principal Investigator's Signature ---------- Date ----------

Section A: Socio-Demographic background

	Name (Respondent and other members of the household who have shared at least one meal a day over the last six months)	**Sex** 1.Male 2.Female	**Age** (years)	**Relationship to head** 1.Head 2.Spouse 3.Child 4.Grandchild 5.Other blood relative	**Marital status** 1.Married 2.Single 3.Separated 4.Divorced 5.Widow/widower	**Occupation** 1.Farming 2.Trading 3.Fishing 4.Artisan 5.Salaried employment 6.Student 7.Unemployed 8.Others (specify)	**Education level** 1.None 2.Pre-primary 3. Primary 4. Secondary 5. Post secondary
1							
2							
3							

Section B: Social Capital (Trust Participation, Social Engagement and Commitment)

1. The last time you travelled, whom do you leave to take care of your homestead?

[1] Older child [2] Relatives [3] Neighbor [4] Other (specify)

2. In the last 12 months, how frequent have petty crimes been within your community?

[1] Occasional [2] Often [3] Very frequent

3.What do you think is the reason for this?

[1] People are united
[2] People respect each other's property
[3] Law enforcement is strong in the area
[4] High levels of unemployment
[5] Mistrust in the community
[6]Other (specify)

4.What is your main source of information?

[1] Friends/ neighbors [2] Relatives [3] Chief's baraza
[4] Church [5] Media [6] Others (specify)

5.Are you a member of any group?
[1] Yes [2] No
6. What kind of group is it?
[1] Women's group [2] Youth group [3] Church group [4] Welfare group
[5] Others (specify)
7. What were your main reasons for joining this group? ----------
---

8.What activities do you undertake together as a group?
[1] Savings and loans mobilization [2] Income generating activities
[3] Provide social support [4] Environmental management
[5] Others (specify)

9.Apart from the activities you undertake as a group, have you taken part in any community project in the last 12 months?
[1] Yes [2] No

10.What activity was this?
[1] Sinking a borehole/ shallow well [2] Building a church [3] Building a school
[4] planting trees [5] Building gabions [6] Others (specify)

11. On a scale of 1-10, with 10 being the highest, who would you trust to deliver on a promise?
[1] Family Member/Relative
[2] Church Leader
[3] Neighbour/Friend
[4]Local Politician

12. "Adaptation means doing something NEW or DIFFERENT to what you or your community did in the past in order to adapt to climate change"

What have you done to adapt to CC?

[1] Attended meetings with government departments about CC adaptation
Strategies
[2] Held/attended meetings to enable villagers to identify projects to adapt to CC
[3] Held/attended meetings with environmental bodies on how to enforce the Environment Act i.e. enforce environmentally friendly fishing/farming/building strategies
[4] Held/attended training courses to teach new skills to villagers
[5] Built new buildings away from riverbanks
[6] Gave talks in schools about CC adaptation strategies
[7] Had informal talks with friends/others
[8] Nothing
[9] Other_____

13. Have you done these as an individual or a group?
[1] Individual [2] Group

14. What are the reasons for undertaking these activities to adapt to CC?

[1] To preserve the environment for our children
[2] To make our lives more comfortable
[3] To generate income
[4] To reduce the severity of climate change effects
[5] Other (specify)

Section C: Climate Change (Understanding & Impacts)

15.Before this interview, had you heard about climate change?

(Explain in case the terms are unfamiliar)

[1] Yes [2] No [3] don't know

16. Through which media have you heard about CC?

[1] Radio
[2] TV
[3] computer/internet
[4] Local newspapers
[5] Church
[4] NGOs
[5] Meetings
[6] Street theatre/drama
[7] Posters
[8] People (family, friends. kids)
[9] None
[10] Other_____

17. What have you heard about the possible effects of climate change?

[1] Increased erosion
[2] More storms
[3] More rain
[4] Less rain
[5] Hotter temperatures
[6] More disease
[7] Trees may die
[8] Government public utilities may get damaged eg buildings, roads, causeways, ports, airports
[9] Private businesses and houses may get damaged
[10] Don't know
[11] Other _____

18.Do you think climate change is something that is affecting or is going to affect you, personally?

[1] Yes [2] No [3] Don't know

19. Have you experienced any extreme/unusual weather events in the last 5 years?

[1] Yes [2] No [3] Don't know/can't remember

20. If "yes", please describe the most recent significant event:

When did it happen? _____
What happened?_____
21. How did you get a warning (through which media)?
[1] Radio [2] TV [3] Friends [4] Observed changes in the sky/sea
[5] None [6] Other _____ [7] N/A
22. What did YOU do DURING the event?
[1] Stayed put (i.e. where you are) [2] went to a safe location
[3] Other_____ [4] N/A
23. What do you think are the causes of climate change? (do not show answers)
[1] Burning fossil fuels e.g. coal, oil, gas, petrol
[2] Deforestation i.e. cutting down large forests and burning off
[3] Don't know
[4] Other (please note all ideas)

24. How do you feel about climate change?
[1] Fearful/afraid
[2] Disbelief
[3] Confused
[4] Angry
[5] Powerless e.g. I can't do anything
[6] Hopeful i.e. we can do some things to adapt
[7] Sad i.e. we might lose our culture & lands
[8] Don't know
[9] Other_____
25. Why?----------
---

26. Do you know of any things that people can do to reduce the effects of climate change?
[1] Yes [2] No

27. What are some of the things people can do to reduce the effects of climate change
[1] Must plant trees/bushes
[2] Must look after trees/bushes
[3] Must avoid cutting down the trees
[4] How to build gabions to prevent erosion
[5] Should not cultivate on the river banks
[6] Must avoid burning bushes or waste
[7] Everyone needs to cooperate in adapting to CC
[8] Nothing
[9] Other_____
[10] N/A

Appendix II. KII Guide

1. What is the purpose of this organization?
2. What is role and responsibilities?
3. How many communities do you work with?
4. During the last year, what extreme climate event has this community experienced; what were the effects?
5. What factors could you attribute to this event?
6. How did the community organize itself to respond to the crisis?
7. How did your organization help the community resolve the problem?
8. What are some of the medium and long term measures that the community put in place to prevent a similar occurrence?
9. In what ways is this community still vulnerable?
10. What do you see as the difference between the communities on each section of the river?

Appendix III: FGD Guide

1. During the last 10 years, what extreme climate event has this community experienced; what were the effects?
2. What factors could you attribute to this event?
3. How did the community organize itself to respond to the crisis?
4. What does this community do in their own capacity to improve their lives
5. Are there organizations that the community depended on to respond to this crisis?
6. In what ways is this community still vulnerable?
7. How does the community incorporate neighboring communities in its activities towards adaptation to climate change

Appendix IV: MUERC Approval

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
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Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 21st July, 2015

TO: Lillian Atieno Omondi
PG/PHD/00027/2011
Department of Sociology and Anthropology
School of Arts and Social Sciences
Maseno University

REF: MSU/DRPI/MUERC/00181/15

RE: Social Capital for Adaptation to Climate Change in the Mara River Basin, Kenya. Proposal Reference Number MSU/DRPI/MUERC/000181/15

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 21st day of July, 2015 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 20th July, 2016. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 12th June, 2016.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 12th June, 2016.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

Yours faithfully,

DIRECTORATE OF RESEARCH PUBLICATION & CONSULTANCIES 21 JUL 2015 MASENO UNIVERSITY

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee.

Cc: Chairman,
Maseno University Ethics Review Committee.