Climate Change and Vulnerable Coastal Communities in Ghana

Catherine Doe Adodoadji-Dogbe

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Abstract

This study examines the relationship between climate impacts and existing vulnerabilities amongst coastal dwellers in Ghana. The study analyses how social relations of power affects access to resources and decision making and their implications for vulnerability and adaptive capacity under changing climatic conditions. It also examines the role that policy plays in addressing vulnerabilities to climate impacts in the study communities. Using a perspective that is important but often overlooked in the study of vulnerability and adaptation to climate impacts in Ghana, the thesis examines the root causes i.e. the structural and relational drivers of vulnerability and the extent to which adaptation policies address these root causes. This thesis contributes to the ongoing debate on the politics of adaptation, the need for adaptation policies to address the underlying causes of vulnerability specifically the social relations of power that produce inequalities.

A qualitative mixed-methods approach consisting of participatory tools, focus group discussions and semi-structured interviews were used in collecting data at the household, community and institutional level. Results from the study show that existing vulnerabilities created from development trajectories pursued in the past interact with climatic impacts to further exacerbate vulnerabilities and decrease adaptive capacities of households in the study communities. It also shows that unequal social relations of power drive differential vulnerability patterns among households in the study communities. The results show that the access profile of a household influences the strategies used in responding to climatic impacts. Also, climate change related adaptation policies by government and other actors do not adequately address the underlying causes of vulnerability consequently perpetuating vulnerabilities and reducing the adaptive capacities of households in the study communities. The study concludes that for adaptation policies to be more effective they need to address the underlying causes of vulnerability or the existing inequalities that reproduce and sustain vulnerability to climate impacts and which undermine adaptive capacities.

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Acronyms and Abbreviations

ADB	Agricultural Development Bank
AR5	IPCC 5th Assessment Report
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CBFMC	Community-Based Fisheries Management Committees
CCAFS	Climate Change, Agriculture and Food Security
CDKN	Climate & Development Knowledge Network
CFL	Compact Fluorescent Lamps
CHPS	Community-based Health Planning and Services
CSO	Civil Society Organisations
DFID	Department for International Development
DWF	Distant Water Fleet
ENSO	El Niño Southern Oscillation
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
FASDEP	Food and Agriculture Sector Development Policy
FBO	Farmer Based Organisations
FD	Fisheries Department
FEU	Fisheries Enforcement Unit
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse Gas
GSGDA	Ghana Shared Growth and Development Agenda
GWSC	Ghana Water and Sewerage Corporation
HFA	Hyogo Framework for Action
ICFG	Integrated Coastal and Fisheries Governance
ICT	Information and Communication Technologies
IDA	International Development Association

IDS	Institute of Development Studies
IFPRI	International Food Policy Research Institute
IIED	International Institute for Environment and Development
IIPAC	Innovative Insurance Products for Adaptation to Climate Change
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-Tropical Convergence Zone
IUU	Illegal, unreported and unregulated
KKD	Kpone-Katamanso District
KNOTS	Knowledge, Technology and Society Team
LAP	Land Administration Project
LBC	Landing Beach Committees
MCS	Monitoring, Control and Surveillance
MDA	Ministries, Departments, Agencies
MESTI	Ministry of Environment, Science, Technology and Innovation
METASIP	Medium-Term Agriculture Sector Investment Plan
MFI	Microfinance Institutions
MFRD	Marine Fisheries Research Department
MIC	Middle Income Countries
MLGRD	Ministry of Local Government and Rural Development
MMDA	Metropolitan, Municipal and District Assemblies
MMDCE	Metropolitan, Municipal and District Chief Executives
MOFA	Ministry of Food and Agriculture
MOFAD	Ministry of Fisheries and Aquaculture Development
MOFEP	Ministry of Finance and Economic Planning
MOH	Ministry of Health
MP	Members of Parliament
MTDP	Medium Term Development Plan

NADMO	National Disaster Management Organization
NAEP	National Agricultural Extension Policy
NAMA	Nationally Appropriate Mitigation Actions
NCAP	Netherlands' Climate Assistance Programme
NCCAS	National Climate Change Adaptation Strategy
NCCP	National Climate Change Policy
NDPC	National Development Planning Commission
NHIS	National Health Insurance Scheme
NIC	National Insurance Commission
NLP	National Land Policy
NUP	National Urban Policy
OECD	Organisation for Economic Co-Operation and Development
PAR	Pressure and Release Model
PHC	Population and Housing Census
RCC	Regional Coordinating Council
SAP	Structural Adjustment Policy
SES	Socio-ecological Systems
SFC	State Fishing Corporation
SFMP	Sustainable Fisheries Management Project
SLA	Sustainable Livelihood Approach
SRI	Sustainability Research Institute
UNCOD	United Nations Conference on Desertification
UNDP	United Nations Development Programme
UNRISD	United Nations Research Institute for Social Development
VMS	Vessel Monitoring System
WEDO	Women's Environment and Development Organization

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CHAPTER 1

1.0 INTRODUCTION

1.1 Overview of the Research Problem

Global climate change is occurring and there is increasing evidence that human influence has been the dominant cause of observed climatic changes.[1] In the recent Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (AR5), changes in observed increase in global average surface temperature have been attributed to anthropogenic increases in greenhouse gas concentrations and other anthropogenic forcings.[2] Observed increases in atmospheric moisture content have also been attributed at medium confidence to anthropogenic influences, to global-scale changes in precipitation patterns over land and to intensification of heavy precipitation over land regions (IPCC, 2013). Global sea levels have increased mainly due to increased ocean warming and increased loss of mass from glaciers and ice sheets (IPCC, 2013). Local sea level trends are also influenced by factors such as regional variability in ocean and atmospheric circulation, coastal erosion, and coastal modification (IPCC, 2014a).

Like many other countries, Ghana has also observed changes in climatic trends. Over the last 30 years the country has been experiencing rising temperatures, decreased and highly variable rainfall patterns, rise in sea levels as well as extreme weather events such as droughts and floods. The average annual temperature of Ghana has increased by about 1°C (1960 – 2000). Variability in temperature and rainfall patterns in Ghana and other West African countries is linked to the variations in the movement and intensity of the Inter-Tropical Convergence Zone (ITCZ), as well as variations in the timing and intensity of the West African Monsoon. El Niño Southern Oscillation (ENSO) is associated with drier than average conditions in West Africa and is considered to be the most likely cause of these variations on an inter-annual timescale (USAID, 2011; World Bank, 2011). There has been an increase in sea-surface temperatures as

[1] Findings from WGI AR5 state that, "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century" (IPCC, 2013: 17).

[2] According to the report greenhouse gases contributed a global mean surface warming likely to be in the range of 0.5°C to 1.3°C, over the period 1951 to 2010, with the contributions from other anthropogenic forcings, including the cooling effect of aerosols, likely to be in the range of −0.6°C to 0.1°C. The contribution from natural forcings and natural internal variability is likely to be in the range of −0.1°C to 0.1°C (IPCC, 2013: 17).

well as a rise in sea levels at a rate of 2.1 mm per year over the last 30 years. The country has also experienced extreme events of droughts and floods. Periods of intense droughts occurred in 1968 –1973, 1982 –1984, 1990 –1992. Also between 1991 and 2008, Ghana experienced six major floods (USAID, 2011).

Coastal communities in Ghana, like in many other developing countries, are highly vulnerable to climate change and climatic variability. They are at risk from the increased frequency and intensity of extreme-weather events as well as sea-level rise associated with climate change. Over the years these communities have deployed various methods to adapt to or cope with climatic impacts, however these strategies have been put under considerable stress because of the accelerated rate and scale at which human-induced environmental changes occur and the uncertainties inherent in climate projections (Gyampoh et al., 2009; IPCC, 2014b). Vulnerability to the impacts associated with climate variability and change in Ghana is socially and spatially differentiated. It differs both by ecological zones and socio - economic groups. In Ghana, small-scale food crop farmers, slum dwellers and fishers are some of the socio-economic groups identified to be affected most by climate change (NCCAS, 2012).

Vulnerability to the impacts associated with climate change and variability are shaped by broader social, political and economic processes. These processes influence the way that power operates in a society and determines who is most at risk from hazards. The pattern of wealth and power acts as major determinants of the level of vulnerability across a range of people (Wisner et al., 2004: 93). Power operates on various scales and takes root historically in particular patterns of social relations (Taylor, 2013: 5). Social relations of power are central in determining access to resources as well as how people cope with or adapt to hazards. Different social groups have different levels of vulnerability. This is as a result of their ability to access resources and participate in decision making. The ability to access resources can determine where people will live, the kind of work they will engage in, the type of buildings they will live in, the kind of information, assets, resources and support systems they could have access to. Poorer groups are more likely to live in environmentally marginalised environments, engage in dangerous livelihoods and have uncertain access to resources (Wisner et al., 2004).

Vulnerability is produced and reproduced within overlapping structures of power that operate at different spatial scales. These power relations act as sources of security for some and vulnerability for others (Taylor, 2013). Identifying and addressing the underlying power relations of vulnerability is essential for the implementation of effective adaptation policies. To address vulnerability to climate impacts there is the need to understand existing inequalities. The role that social relations of power play in producing vulnerabilities, influencing people's access to assets and how this affects local adaptation strategies. The inability of most adaptation policies to address existing inequalities have often perpetuated or sustained vulnerability.

Given the accelerated rate and magnitude of climate impacts and given the character and distribution of vulnerability to climate impacts and other socio-economic and political factors in Ghana, current policies do not seem to get to grips with the implications of these issues for policy objectives. In the next section, the research questions which will be used to examine the relationship between climate impacts, vulnerability and policies in Ghana will be discussed.

1.2 Research Aim and Research Questions

The main purpose of this thesis is to examine the relationship between climate impacts and existing vulnerabilities amongst food crop farmers, fishers and slum dwellers in three coastal communities in Ghana. The study looks specifically at how social relations of power affects access to resources and decision making and their implications for vulnerability and adaptive capacity under changing climatic conditions. The study also examines the role that policy plays in addressing vulnerabilities to climate impacts in the study communities.

The study seeks to answer the following questions:

- How does the interplay between climate impacts and existing vulnerabilities influence vulnerability levels and adaptive capacities of coastal communities in Ghana?
- How do social relations of power affect access to resources and decision making and what are their implications for vulnerability and adaptive capacity of coastal dwellers under changing climatic conditions?
- In which ways do government interventions on climate change and broader policies or interventions interact with vulnerability and adaptation in coastal communities?

This thesis draws on the Pressure and Release model (PAR) and the Access model of Wisner et al., (2004) to make the arguments that the interplay of existing vulnerabilities with climate impacts exacerbates vulnerability levels and reduces adaptive capacities. It also argues that the inability of adaptation policies to address the underlying causes of vulnerability / existing inequalities reproduces and sustains vulnerability to climate change impacts. Wisner et al, (2004) and Blaikie et al., (1994) emphasis on the root causes of vulnerability is especially useful for this analysis as it allows us to think through the progression of vulnerability from the root causes through dynamic pressures to unsafe conditions which interact with hazards to create outcomes. To this end, Wisner et al., (2004) and Blaikie et al., (1994) conceptualisation of vulnerability as a process is generative for grasping how the underlying causes of vulnerability i.e. the social, political and economic processes, allocate assets, income and other resources in a society to create conditions in which hazards have a differential impact on various societies and different groups within society. Also, in their access model Wisner et al., (2004) attention to how household's access resources, is of value for understanding the causes and symptoms of vulnerability. The resources that a household has access to, enables it to cope or adapt to adverse climatic impacts. An understanding of the causes and symptoms of vulnerability is useful for implementing effective adaptation policies. Although difficult to enact and far likelier to be resisted, adaptation policies that take into consideration the social relations of power that produces households' access profile, income opportunities, their choices and decisions as well as livelihood strategies are more effective as they deal with the root causes of vulnerability.

1.3 Contribution to Knowledge

The study contributes to the ongoing debate on the politics of adaptation, the need for adaptation policies to address the underlying causes of vulnerability specifically the social relations of power that produce inequalities. Using a perspective that is important but often overlooked in the study of vulnerability and adaptation to climate impacts in Ghana, the thesis examines the root causes (structural and relational drivers) of vulnerability and the extent to which adaptation policies address these root causes. Analysing the root causes of vulnerability is useful in identifying the inequalities that undermine adaptive capacities and that cause vulnerability to be socially differentiated. Filling this empirical gap is important as it will

increase our understanding of vulnerability and adaptation to climate impacts in Ghana as well as provide information on how policy level interventions could hamper or strengthen future adaptation prospects.

The study also makes a theoretical contribution by modifying the PAR model to show the causal relations between climate change and socio-politico-economic processes. The PAR model by Wisner et al., (2004) does not show how environmental externalities like climate change which is generated by particular socio-politico-economic dynamics, impact not just on people in the midst of a 'pressure point', but also on the longer-term socio-politico-economic processes that are considered as root causes. The study addresses this limitation by modifying the PAR model to capture how the root causes of vulnerability i.e. the social, political and economic processes which drive vulnerability are fundamentally implicated in producing global environmental change and how the root causes of vulnerability are themselves affected by global climate change. Filling this empirical gap is important as it will increase our understanding of human-environmental feedbacks and how responses to climate change affects or changes society, politics and economics.

1.4 Structure of the Thesis

The thesis consists of eight chapters. The introductory chapter presents an overview of the research problem, it outlines the research aim and questions and discusses the contribution of the study to knowledge. It also presents the structure of the thesis and key findings. Following this introductory chapter, chapter two provides information on previous studies on vulnerability and adaptation to climate variability and change more broadly and in the context of Ghana. This chapter discusses the challenge in distinguishing climate change and variability at the level of individuals and households. The chapter also discusses the two competing interpretations of vulnerability in the climate change context i.e. the contextual or starting point and the outcome or end point interpretation. The tensions in the understanding of vulnerability and impacts as well as the underlying drivers of vulnerability i.e. the economic, political and demographic processes which interlock to give rise to and reproduce vulnerability over time and which affect the allocation and distribution of resources, among different groups of people are also discussed. The chapter also discusses the relationship between vulnerability and resilience looking at how the uncertainties associated with climate change provides a condition

to build resilience. It also discusses decision making under climate change uncertainty. A general over view of vulnerability and adaptation to climate change in Ghana and the strategies used by households to respond to climate impacts is also discussed in this chapter. The chapter also presents some of the key policies and initiatives that have been implemented to address climate change challenges in Ghana.

Chapter three presents and discusses the conceptual framework guiding the study i.e. the Pressure and Release Model (PAR) and the Access model by Wisner et al., (2004). Concepts that were incorporated into these models are also discussed in this chapter. These include elements of the sustainable livelihood approach (DFID, 1999), the livelihood strategies scheme developed by Dorward et al., (2009) and the policy processes framework by Keeley and Scoones (1999). The PAR model is employed in this study to provide an explanation for vulnerability, by tracing the progression of vulnerability from the root causes, dynamic pressures and unsafe conditions which interact with hazards to create outcomes. It also explains the feedback loops and causal relations between climate change and social systems. The thesis also draws on the access model to provide an explanation of vulnerability at the community and household levels. To explore the links between access profile, livelihood strategies and livelihood outcomes the framework incorporates Doward et al., (2009) classification of livelihood strategies of 'hanging in', 'stepping up' and 'stepping out' including livelihood diversification and migration (Scoones, 1998). To analyse the climate change policy process, the policy process framework (Keeley and Scoones, 1999) was also applied to understand how the intersection between narratives, actors-networks and politics-interests influence climate policies and their impact on local issues of vulnerability and adaptive capacity.

Chapter four describes the study area and provides reasons for its selection. The study was conducted in three coastal communities in the Greater Accra region of Ghana. Tema a fishing community and Kpone a farming and fishing community were purposively selected to provide information on the livelihood groups and economic sectors that are most vulnerable to climate change. Ashaiman an informal community on the other hand was selected to provide information about the impact of climate change on the urban poor. The chapter also outlines the methods used in data collection and the activities that took place at the various stages of the field work. It also provides details of the sampling methods used in selecting respondents.

The tools that were used in the data collection and their relevance for the research are outlined in this chapter. Ethical considerations, the process of data analysis as well as the study limitations are also discussed in this chapter. A qualitative mixed-methods approach consisting of participatory tools, focus group discussions and semi-structured interviews were used in collecting data at the household, community and institutional level. Data collected from the three communities were transcribed and uploaded in NVivo for coding. After initial coding, matrix coding queries were run in NVivo in order to compare the views of different demographic groups on major themes identified. Results from the matrix coding queries were used in the analysis and discussion in chapters five, six, and seven. The analysed field data was triangulated with data from secondary sources to ensure its validity.

The findings from the field study are analysed in chapters five – seven. In chapter five the seasonal calendar and wealth grouping are used to provide an explanation of the livelihood profile of the study communities. The seasonal calendar is used to identify the main activities that people engage in to obtain an income and the hazards that affect them. It also provides some information about the extent to which households diversify their livelihoods and the variation in the access to food and cash throughout the year. The wealth grouping is used to explain the differences between various groups in the communities. The communities' perception of climate variability and change is also discussed to understand the changes that have taken place in the communities over time and the hazards that affect the community. This chapter also examines how existing vulnerabilities have interacted with climate impacts over time to influence vulnerability levels and adaptive capacities in the study communities. Some of Ghana's development trajectories are analysed to see how they have contributed in making households vulnerable and more exposed to climate variability and change. The focus is on the processes that directly affect the livelihoods of fishers, farmers and urban informal dwellers. These include processes that have led to the springing up of informal communities, the management of marine fisheries and urban land management.

Chapter six analyses how social relations of power influences, access profiles, and how this in turn influences livelihood options, income opportunities household choices and decisions as well as livelihood strategies of the various social groups in the field sites. The relation between diverse social groups including men, women, youth, landlords, tenants, state officials and

commercial lenders in the field sites are analysed. The chapter discusses how these relations bring about entrenched inequalities and dependencies in the face of climatic changes. The chapter also discusses how access influences the capacity of households to adapt to / cope with shocks and stress. This chapter discusses how access profile influences household's adaptation and coping strategies. The chapter also discusses how households adapt to / cope with changes through livelihood strategies of hanging in, stepping up, stepping out / livelihood diversification and migration.

Chapter seven discusses how national level policies / interventions interact with vulnerability and adaptation at the local level. It looks at the role that policy plays in addressing vulnerabilities to climate impacts in the study communities. The chapter also analyses the ways in which adaptation policies address or fail to engage with the structural / root causes of vulnerability. It examines the role of donors in the policy process and the extent of local participation in decision-making. It also discusses how prevalent narratives and institutional perception influences policy responses/initiatives. This chapter discusses policy documents that are relevant to findings in the field site, these include policies covering land access, illegal fishing as well as urban planning. The chapter discusses how these national level policies / interventions interact with local level vulnerability. It also analyses the policies to find out if they are addressing the structural / root causes of vulnerability and their effects on vulnerability and adaptation. The chapter discusses how prevalent climate narratives and institutional perception influences the policy responses/initiatives that are taken in particular sectors. It also examines how climate change narratives are being used to support neo-liberal ideologies which give rise to vulnerabilities. This chapter discusses some issues concerning the implementation of climate policies in the country. It examines funding sources and funding allocation for climate projects. It also examines the focus areas, the target groups, target sectors and beneficiaries of climate policies and interventions. Community members awareness / knowledge of climate interventions are also discussed in this chapter. In the concluding chapter, key findings from the empirical chapters are discussed and the policy implications of the findings for local communities analysed. The chapter also presents policy implications and recommendations for future research. A summary of the key findings is provided in **Table 1.1**

1.5 Summary of Key Findings

Table 1.1 Summary of Key Findings

Interaction of existing vulnerabilities with climatic impacts
Existing vulnerabilities created from development trajectories pursued in the past interact with climatic impacts to further exacerbate vulnerabilities and decrease adaptive capacities of households in the study communities. Neoliberal structural adjustment policies, the urbanisation process, the methods of managing urban land and marine fish resources in the past have created vulnerabilities which interact with climatic impacts to further exacerbate vulnerabilities and decrease adaptive capacities of households in the study communities. The implementation of Neoliberal structural adjustment policies which involved the liberalisation of local markets, retrenchment of public sector workers, reduction of government spending through cuts in social services like health education and housing increased social and spatial inequalities in the country. These policies have increased the vulnerability levels of households and made them less resilient to adapt to climate variability and change. Liberalised markets exposed farmers and fishers to unequal competition undermining their livelihoods and reducing their profitability. The increasing cost of rent as a result of the liberalized housing market forced low – income households to relocate to sub-standard houses in the urban peripheries where they are more exposed to adverse climatic impacts. The withdrawal of government subsidy led to a hike in the prices of agricultural inputs and fishing gears consequently reducing productivity levels. Cuts in social services like health education and housing led to an increase in the cost of these services and a decline in real wages, this worsened the plight of the poor. Retrenchment of public sector workers led to an increase in urban unemployment. Low incomes coupled with adverse climatic impacts further increased vulnerabilities. Urban planning continues to follow the social stratification system introduced by the colonial administrators. This has led to residential segregation and promoted slum and unplanned settlements in urban communities (Aboagye, 2012: 161). Unplanned settlements are often located in unsafe places such as flood prone areas. They lack basic social amenities like water, sanitation, waste disposal and drainage facilities. Poor settlers in unplanned

communities are more exposed to adverse climatic impacts like floods and are often victims of forced eviction. The increasing demand for land for various urban uses has led to the commercialization of land by local elites making it difficult for small scale farmers to have access to land for farming. By selling farmlands, the livelihood opportunities of local elites like traditional authorities who are custodians of the land are enabled whilst that of poor local farmers are hindered. This leads to a widening of social inequalities and increases farmers vulnerabilities to climatic impacts.

Modernization of the fishing sector by the government has influenced the vulnerability levels of fishing communities in the country. For instance, the introduction of the outboard motor increased its use and the exploitation of marine fish resources. The government's role to maintain, fishing efforts by giving subsidies on premix fuel supports unsustainable usage of fisheries resources which leads to the depletion of fish stocks. In addition, premix fuel meant for the fishers has sometimes been diverted onto the black market, leaving fishers, particularly the marginalised unable to access premix when necessary (Tanner et al., 2014). Also, the increasing competition from foreign vessels, the failure of the government to control access to fisheries resources has led to a decline in profit. Overfishing and the increasing competition from foreign vessels increases fishers' vulnerability and makes them less resilient to climatic impacts.

Unequal social relations of power and differential vulnerability

Unequal social relations of power drive differential vulnerability patterns among households in the study communities.

Vulnerability to the impacts associated with climate variability and change in the study community is socially differentiated. Poor and very poor households are more vulnerable to climate impacts than better-off households. Social relations of power influences access to capital assets (financial, physical, social, human and natural capital) upon which livelihoods are built. The unequal social relations in accessing these assets brings about entrenched inequalities and dependencies in the face of climatic changes.

Financial capital: There are unequal power relationships between poorer households and commercial and local money lenders. Poor and very poor households in the study communities face a challenge in accessing finance. They are dependent on commercial and local money lenders who charge high interest rates, demand documents and collateral before providing credit. They also use coercion and other shaming practises to ensure loan repayment. Poor and very poor households are often unable to fully pay back their debts on time. As most fishers and farmers borrow money from market traders they bear a greater risk. Even when, there is a crop failure due to climate variability or if fish catch is low the farmers and fishers are still obliged to pay the debt. This gives market traders an advantage over them.

Human capital: Education leads to differing vulnerabilities to climate impacts. Better off households with higher levels of education engage in wage earning activities which provides a more regular source of income that helps them to respond more effectively to climate impacts as compared with poor and poorer households who have lower education levels and tend to work on jobs that are irregular, low paying and often in unsafe environments.

Natural capital: The unequal power relations that exist between men and women is also seen in the location of farms. Male farmers tend to be less vulnerable to climate impacts as compared to female farmers. Unlike the women most of the male farmers are situated near waterways and streams, which allows them to practise irrigation farming so that they can farm even in the dry season. Most women do not farm at all in the dry season because of decreased water supply. Access to productive resources like land are often mediated by men (chiefs, family heads, husbands, fathers and brothers). As a result of the traditional patriarchal system, male farmers are often allocated larger plots of land and productive land near water resources. Traditionally, the responsibilities of men in the household are considered to be greater than women. Men are considered to be the main providers of the family, consequently they are given preferential access to land resources so that they can have the necessary material resources to meet the needs of the family.

Physical capital: The unequal relations between farmers and market traders as well as fishmongers and fish traders' results in differing levels of vulnerability between these

groups. During periods of bumper harvest of fish or crops, market traders who are often from better - off households take advantage of farmers and fishers and compel them to sell their produce at prices lower than the market value because of their inability to store their harvested produce. This has adverse effects on their income and reduces their adaptive capacities.

Social networks: The limited participation of poor and very poor households in social gatherings reduces their access to information and to resources and support which could help them improve the livelihood activities they are engaged in. As a result, they are more likely to be adversely affected by climate change impacts.

The influence of access profile on adaptation and coping strategies

The access profile of a household influences the strategies used in responding to climatic impacts. A household's decision to use a particular strategy over another depends on their access to particular assets.

As compared to poorer households, better off households use more cost-intensive methods to respond to climatic events. Poorer households respond to floods by clearing and dredging drainage facilities before the onset of rains, they also make temporary channels to facilitate the flow of water. Better - off households on the other hand construct concrete embankments or walls to prevent flood waters from entering their homes and shops. They also raise the floor foundation of concrete buildings. Better - off households with wide social networks relocate temporarily to live with family and friends.

In anticipation of periods of water shortages better-off households buy larger and more durable storage tanks so they can store water for a longer period. They can also afford to purchase water from private water tankers. Poorer households on the other hand go longer distances to fetch water during such times.

The main livelihood strategies that households in the study community employ to adapt to climatic impacts in the communities include diversifying their livelihoods and migration. As migration in fishing requires the use of productive assets which are cost intensive and

migration in farming requires access to social networks at migrant destination they are used more widely by better-off households than poor and very poor households.

The aspirations of most households in the study communities to step up and/or step out in their livelihood activities is often hindered by their limited access to productive assets. As compared to poorer households, better-off households who have access to a wide range of assets particularly productive assets can combine these assets to widen their income earning portfolio to cover shocks or stresses.

Reproducing vulnerability through adaptation policies

Climate change related adaptation policies by government and other actors do not adequately address the underlying causes of vulnerability consequently perpetuating vulnerabilities and reducing the adaptive capacities of households in the study communities.

The National Land Policy (NLP) for instance does not address unfair practices affecting access to land by vulnerable groups. In this policy access to land is supposed to be secured through land registration / land titling. As registration of the land involves high costs, it leads to the exclusion of the poor, particularly poor marginalised farmers. This affects their ability to earn a livelihood.

Urban planning which has often been top down further marginalises the poor. To construct a building in an urban community one requires a building permit. It is a long and expensive process to apply for a building permit consequently low-income household relocate to informal settlements where they are highly exposed to climatic impacts because of the unsafe conditions.

In the fisheries sector the implementation of capacity - enhancing fisheries subsidies like the premix fuel provides an incentive for overfishing and exploitation of marine fish resources. Also the implementation of the Community-Based Fisheries Management Committees (CBFMCs) brought about unequal power relationships between fishers and influential

committee members. Some committee members took advantage of this position and used it in rent -seeking activities particularly when vying for positions as local leaders.

Institutional actors' perception about the climate change problem and adaptation in local communities influences the solutions they propose to address the challenges these communities face. The climate change-agriculture (fishing and farming) narratives are centered on livelihood and food security. They are also centered on climate policies delivering 'triple wins' i.e. addressing adaptation, mitigation and social development simultaneously. The proposed measures to ensure food security, sustainable livelihoods and 'triple wins' are often technocratic and do not address inequalities but rather reinforce existing power relationships.

Urban - climate change debates on the other hand have been framed in terms of disaster risk reduction. They have been framed to focus on environmental protection and have also been linked to migration and poverty. Measures proposed to address these framings aim at increasing the resilience of households and communities to climate impacts. Resilience to climate impacts in this instance is being used to support capitalism. It provides business opportunities for the politically connected and national elites allowing them to further enrich themselves. The proposed solutions do not address the social causes of vulnerability this further exacerbates spatial and social inequalities.

With regards to institutional perception about climate change adaptation in local communities. Institutional actors believe that some actions of local communities have exacerbated climatic impacts. For instance, the improper disposal of waste in the informal community leads to choked drains and increases the incidence of floods, unsustainable farming practices results in the depletion of soil fertility and low crop yields and the use of illegal fishing methods have led to a decline in fish catch. In all cases institutional actors propose awareness creation and education as actions to help address these challenges. The solution they propose does not address the underlying causes of vulnerability that is the unequal power relations that cause inequalities and that give rise to vulnerabilities in the communities.

CHAPTER 2

2.0 LITERATURE REVIEW

This chapter provides information on previous studies on vulnerability and adaptation to climate variability and change more broadly and in the context of Ghana. In the first instance, the chapter discusses the difficulty in distinguishing climate change and variability at the level of individuals and households. This discussion is useful to understand how personal experiences of changes in local weather conditions are translated to perceptions of climate variability and change and their influence on adaptation. The chapter also discusses the two competing interpretations of vulnerability in the climate change context i.e. the contextual or starting point and the outcome or end point interpretation. The tensions in the understanding of vulnerability and impacts as well as the underlying drivers of vulnerability i.e. the economic, political and demographic processes which interlock to give rise to and reproduce vulnerability over time and which affect the allocation and distribution of resources, among different groups of people are also discussed. A general over view of vulnerability and adaptation to climate change in Ghana and the strategies used by households to respond to climate impacts are also discussed in this chapter. These discussions are useful for examining the relationship between climate impacts and existing vulnerabilities as well as explaining how social relations of power affects access to resources and decision making and their implications for vulnerability and adaptive capacity under changing climatic conditions. The chapter discusses the relationship between vulnerability and resilience looking at how the uncertainties associated with climate change provides a condition to build resilience. It also discusses decision making under climate change uncertainty. Some of the key policies and initiatives that have been implemented to address climate change challenges in Ghana are also discussed in this chapter. These discussions are also useful for understanding the role that policy plays in addressing vulnerabilities to climate impacts.

2.1 Distinguishing Climate Variability and Change

Climate variability is defined as the variations in the mean state and other statistics (such as standard deviations and the occurrence of extremes) of the climate on all spatial and temporal

scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability) such as the El Nino-Southern Oscillation (ENSO), resulting from the interaction between the atmosphere and ocean in the tropical pacific. or to natural variability or anthropogenic forces (external variability) such as variations in solar radiation, volcanic eruptions and the earth's orbital changes (IPCC, 2007b: 944). Climate change on the other hand refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes (IPCC, 2007b: 943). Climate change is a long-term continuous change over a period of at least 30 years.

Individuals and households often find it difficult to distinguish climate variability from climate change. Whilst climate variability is the inter annual or seasonal variations in rainfall and temperature, often perceived at the local or regional level, climate change is a slow and gradual process that is very difficult to perceive without scientific records. Individual and household perceptions about climate change to a large extent are influenced by their reliance on the climate for their livelihoods, the spatial scale of changes and the reference periods over which they establish representations of a normal climate (Howe and Leiserowitz, 2013). As qualitative perceptions about climate change could be biased, there is therefore the need to triangulate information provided by households and individuals with meteorological data to make it more reliable. The ability of household's and individuals to translate personal experience of changes in local weather conditions to perceptions of climate variability and change is crucial for adaptation.

2.2 Defining and Interpreting Vulnerability in the Climate Change Context

Vulnerability is a central concept within climate change research. Several frameworks have been developed to categorize vulnerability factors and to describe different vulnerability concepts. Vulnerability factors have been mainly categorized as either internal/external (Bohle, 2001; Chambers, 1989), socio-economic/biophysical (Brooks, 2003; Cutter, 1996). Fussel (2007) provides a classification scheme for describing the varying vulnerability concepts. This scheme distinguishes between two largely independent dimensions i.e. sphere (distinguishing

internal from external factors) and knowledge domain (distinguishing socio-economic from biophysical factors).

Socio - economic vulnerability factors classified under the knowledge domain are affected by economic resources, the distribution of power, social institutions, cultural practices and the characteristics of social groups whereas biophysical vulnerability factors are affected by the properties of a natural system. Internal vulnerability factors classified under the sphere dimension indicate properties of the vulnerable system whereas external vulnerability factors denote something outside the vulnerable system. In the IPCC TAR (2001) vulnerability is defined as ‘‘the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It is conceptualised as a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity’’ (IPCC, 2001: 388). In this definition exposure has an external aspect, while sensitivity and adaptive capacity have an internal aspect.

Fussel (2007) and O’Brien et al., (2007) identify two competing interpretations of vulnerability in the climate change context. These include the contextual or starting point and the outcome or end point interpretation. Vulnerability according to the end-point interpretation represents the net impacts of climate change taking into account the socio-economic capacity to cope and adapt (Fussel, 2007; O’Brien, Eriksen, et al., 2004; O’Brien et al., 2007; Wisner et al., 2004). This interpretation is useful for defining the degree of climate impact and providing inputs such as the costs for mitigation or adaptation (O’Brien, Eriksen, et al., 2004). Reducing outcome vulnerability involves reducing exposure through climate change mitigation or developing adaptations to limit negative outcomes (O’Brien et al., 2007).

With the starting point interpretation, vulnerability is viewed as a general characteristic generated by multiple environmental and social processes but exacerbated by climate. It is based on a processual and multidimensional view of climate-society interactions (O’Brien, Eriksen, et al., 2004; O’Brien et al., 2007). Both climate variability and change are considered to occur in the context of political, institutional, economic and social structures and changes, which interact dynamically with contextual conditions associated with a particular exposure unit (Kelly and Adger, 2000; O’Brien, Eriksen, et al., 2004; O’Brien et al., 2007). In this interpretation, vulnerability provides a means of understanding how the impacts of climate

change will be distributed. There is also the assumption that addressing internal socio-economic vulnerability to current climate variability will reduce vulnerability to future climate change (Fussel, 2005, 2007; O'Brien, Eriksen, et al., 2004).

Political economy approaches such as Wisner et al., (2004) "At Risk" lean more towards vulnerability as starting point. They refer to vulnerability as the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process). Vulnerability involves a combination of factors that determine the degree to which someone's life, livelihood, property and other assets are put at risk by a discrete and identifiable event (or series or 'cascade' of such events) in nature and in society (Wisner et al., 2004: 11). They examine the economic, demographic, social and political processes that give rise to vulnerability and which reproduce vulnerability over time. This thesis adopts the starting point interpretation by identifying and analysing the social, political and economic factors that explain the different ways in which households and communities are exposed to hazards. The thesis also analyses the capacity of households and communities to recover from hazards as well as their capacity to cope with and adapt to future threats.

2.3 Problematising Vulnerability and Impacts

Climate impact and vulnerability assessments are used to assess impact and vulnerability respectively. They are both necessary for informed policy-making purposes. Climate impact assessment addresses the magnitude and distribution of the consequences of climate variability and change (Ribot et al., 1996). It focuses on the range of outcomes associated with climate variability or change. For instance, drought is associated with a number of outcomes including reduced crop yield, reservoir depletion, hydroelectric interruptions, dryland degradation, famine or dislocation. Ribot (1995) argues that direct outcomes of a climatic event are usually the result of a multitude of causal agents and should not be designated as impacts of climate variability or change. Causal agents may include socio-economic, cultural and political factors such as adverse policies, extreme poverty, social exclusion, inadequate social services and infrastructure, lack of rights and access to productive resources like land and water. Categorizing direct outcomes of a climatic event as impacts of climate variability or change implicitly attributes to nature causality that can be directly traced to social organisation. Ribot

notes that it's the combination of causal agents and not the singular result of drought or a climate event that makes an individual, household, nation or region vulnerable.

Vulnerability analysis on the other hand requires more than analysing the direct outcomes of a hazard. It provides a basis for tracing out social causality. Vulnerability analysis examines the multiple causes of single outcomes rather than the multiple outcomes of a single event (Ribot, 1995).Vulnerability and climate impact assessments are overlapping and interlinked. Vulnerability assessment extends impact assessment by highlighting who, how and why particular groups or people are susceptible to impacts. It ensures that the assessment of impacts will be extended into the realm of social, political and economic causality that shapes susceptibility to impacts. Vulnerability analysis aims to link impact analysis to the causes of vulnerability in order to facilitate the policy process. Understanding causality, facilitates appropriate policy design. Ribot et al., (1996) contend that social, economic and political processes produce vulnerability therefore climate impact analyses must include a multi-causal perspective where climate is viewed as one causal agent among many. They also note that care must be taken not to mix proximate causes of vulnerability with root causes as proximate causes tell only part of the story. Mapping out the proximate vulnerability factors like location, livelihood, education and income level, without looking at root causes, of vulnerability such as rent structures, usurious credit arrangements and terms of trade tells only part of the story. They suggest that to reduce vulnerability, policy analysts must go beyond identifying proximate causes to evaluating the multiple causal structures and processes at the individual, household, national and international levels.

2.4 The Underlying Drivers of Vulnerability

Economic, political and demographic processes interlock to give rise to and reproduce vulnerability over time. These processes affect the allocation and distribution of resources , among different groups of people (Wisner et al., 2004). This section discusses some of the underlying drivers of vulnerability.

2.4.1 The Relationship between Vulnerability and Poverty

Poverty is a central component of vulnerability (Martine and Guzman, 2002). "The concept of vulnerability, although often used as a synonym for poverty, is not the same because poverty

measures are generally fixed in time, poverty is essentially a static concept by contrast, vulnerability is more dynamic and better captures change processes, people move in and out of poverty" (Moser, 1998: 23). Poverty and marginalisation often translate into vulnerability (Adger, 1999). In highly seasonal conditions being poor means being vulnerable (Chambers et al., 1981). Seasonality presents contexts which enable other forces which create and sustain poverty to act more powerfully (Chambers et al., 1981; Devereux et al., 2012; Longhurst et al., 1986). Seasonality refers to any regular pattern or variation that is correlated with the seasons. Adverse seasonality describes the potentially damaging consequences for human well-being of seasonal fluctuations in the weather, and the full range of its associated impacts on lives and livelihoods (Devereux et al., 2012: 1). Longhurst et al., (1986) argue that in Sub Saharan Africa seasonality is part of the process of impoverishment which makes people more vulnerable. Poverty and seasonality are interlinked, without poverty there would be fewer or no adverse seasonal effects. Adverse seasonal climatic conditions coupled with the inability of households to access credit and insurance facilities further traps people in poverty and increases their vulnerabilities. Chambers et al., (1981) contend that reducing or eliminating adverse seasonal effects would reduce the vulnerability of poor people but would not remove poverty which would continue to be sustained by other stronger forces.

Seasonality creates imbalances between energy intake (food consumption), energy expenditure (on-farm and off-farm labour) and food availability (in granaries and local markets), causing seasonal hunger and malnutrition (Devereux et al., 2012). In most rural farming communities, at the end of the dry season, when there is lateness or inadequate rainfall or when there is a wet pre-harvest period food prices increase. For poor households, this reduces the quantity and quality of food they eat. It also leads to a decline in their cash reserves and an increase in illness and mortality rates. However, in the harvest season food is abundant consequently the quantity and quality of food eaten increases, debts can be repaid and there is also a peak in conception rates (Chambers et al., 1981).

Poverty is an important aspect of vulnerability because of its direct association with access to resources (Adger, 1999). Limited access to resources affects the ability of an individual to cope with extreme events. The access to resources involves the ability to use resources (capital, financial, physical, social and natural) to secure a livelihood and to adapt to new and

threatening situations. Access to resources is based on social and economic relations. These include the social relations of production, gender, ethnicity, status and age. In social relations rights and obligations are often not distributed equally (Wisner et al., 2004). Some aspects of access are spatially manifest and are correlated with poverty. For instance, poorer people tend to live in more marginal areas with higher exposure to hazards such as flooding and natural disasters and have poor housing facilities. Access to resources also has a temporal dimension. The access to resources is a prerequisite for recovery from the impacts of hazards (Adger, 1999). Poorer households are less likely to have the resources to cope with and recover from a hazard.

Taylor (2015) however argues that people become vulnerable not only because of a lack of assets but because they are dependent on other social actors to turn their existing assets into tangible livelihoods. Poverty and vulnerability are also influenced by mechanisms of adverse inclusion through which subordinate groups are incorporated within unequal power structures. According to Taylor adverse inclusion is based on varying control over key productive assets such as land, water, and capital between classes, genders and along ethnic or caste lines. These differentials do not only shape the livelihood that a household will engage in and how it copes in conditions of stress but also the social relationships they must enter to achieve these goals. For instance, poor farming households often depend on the range of assets held by others such as land, seed, water and credit for productive activities or consumption. To earn income marginal households, engage in social relations with landlords, traders, money lenders and government agencies. Most of these relationships are often unequal and embedded with indebtedness. In conditions of strong stratification these divisions reinforce relations of power and dependency between social groups as other actors control the productive assets necessary for the pursuit of livelihoods by marginal households. The actors they depend on possess social powers that allows them to profit from them (Taylor, 2015).

2.4.2 Demography

Increasing rate of urban growth is influenced by rural-urban migration and natural population growth rates. Rapid urbanisation as a result of increased rural-urban migration also increases vulnerability. Migrants enter new forms of vulnerability in towns or cities due to the highly commoditised nature of the urban sector. They have to pay for their food and shelter, rather

than rely on their own production (Moser, 1998). They have limited access to natural resources like farm land which is a major productive asset for many poor households in rural areas, as well as limited access to common pool resources which provide fuel and medicine. Most urban residents either rent their house or buy the land on which they build their homes unlike living in a family house or building on family land in the rural community. Poor migrants who cannot afford the high cost of rent or land are forced to occupy unsafe land, construct unsafe habitations or live in informal settlements. Living in informal settlements increases their risk of eviction by the state. They also have to pay for the provision of basic services like toilet facilities, water and waste disposal. They often cannot afford these services which are high-priced. Furthermore, these services are often non-existent leading to poor sanitary conditions and this has negative impacts on their health and well-being.

Rigg and Oven (2015) argue that although re-spatialisation or relocation is the means by which rural populations can access opportunities in other spaces and sectors, re-spatialisation of living increases vulnerability. Unlike rural communities' livelihoods in the cities or towns are not based on diverse, semi-subsistence production but on specialised market-based activities. Most of the urban poor often lack the skills, assets and networks necessary to get these jobs. They engage in informal and precarious work arrangements often associated with low wages and unsafe working environments. Labour is the most important asset of the urban poor. They generate income through wage employment, or indirectly, through the production of goods and services, which are sold through informal sector self-employment activities (Moser, 1998). Re-spatialisation also leads to the loss of co-residential dwelling units consequently reducing support from relations (Rigg and Oven, 2015). The urban poor are vulnerable to social fragmentation (Moser, 1998), social safety nets in urban areas are often weaker than in rural areas. This is largely due to the social and economic heterogeneous nature of the urban area.

Some studies have shown that the geography or location of global poverty is changing. Most global poverty is now concentrated in a set of heavily populated countries that have experienced substantial growth in average income per capita and transitioned from low income to Middle Income Countries (MICs) (Alkire et al., 2015; Kanbur and Sumner, 2012; Sumner, 2012, 2016). Although average income per capita increased for these countries poverty rates did not fall as much (Alkire et al., 2015). Sumner (2012) notes that MICs are now home to the

world's poorest and an expanding 'in-between' group, who are neither non-extreme poor nor non-rich with expenditures of between USD 2 and USD 10 per capita/day. He argues that this 'in-between' group which accounts for about 2.5 billion people worldwide may be above the average poverty line for developing countries but is still at risk of experiencing poverty. This group of people are likely to be in an insecure situation trying to escape the risk of poverty and at the same time hoping to attain the consumption and security of the upper middle classes and elite (Sumner, 2012).

The transitioning of countries like Ghana from low income counties to middle income countries has implications for development assistance. Countries which have transitioned are likely to receive less development assistance because of growth in their national per capita income (Alkire et al., 2015; Kanbur and Sumner, 2012; Sumner, 2012, 2016). Kanbur et al., (2012) argue that excluding or reducing development assistance to MICs based on national per capita income would have negative implications as the bulk of the world's poor live in these countries. They contend that national per capita income should not be used as the key determinant of the volume and composition of aid flows (Kanbur and Sumner, 2012). To ensure equitable allocation of resources at both the national and global level there is the need to identify where the poor live (Alkire et al., 2015). Sumner (2016) notes that as economic growth has expanded national resources in developing countries, poverty will be explicable not by the lack of resources but by examining national inequality, the distribution of resources as well as patterns of economic growth and economic development. In order to reach the poor, country specific policies should therefore be designed taking into account the detailed nature of poverty in each MIC, and the specific institutional and implementation context of development assistance (Kanbur and Sumner, 2012).

2.4.3 Economic Processes

Mainstream institutions of international development have argued that market integration, pursued through the application of neoliberal policies is the best means to achieve economic growth. They claim that greater global economic integration and openness to trade and investment will fuel growth, raise incomes, reduce poverty, drive prosperity and build more resilient lives and livelihoods. Rigg and Oven (2015) and Taylor (2015) however contend that the very processes and policies that are seen to create the conditions for economic growth may

undermine resilience and accentuate vulnerability. Marketisation undermines resilience in many ways exposing households, individuals and communities to new risks and vulnerabilities.

The liberalisation of local markets for instance exposes local producers particularly farmers to unequal competition. It undermines their livelihoods and increases inequalities in the society. Food imports tend to be relatively cheaper than local food production because farmers in developed countries receive more subsidies than those in developing countries. Farmers in developing countries receive little or no subsidies and assistance from their governments consequently they produce at a higher cost and this translates into higher food prices. Although liberalisation is often detrimental to local food producers in developing countries, the attempt of governments to protect local producers by imposing increased tariffs on food imports exacerbates food shortages and increases the vulnerability of marginalised groups. Increased tariffs limits food importation and as the agricultural sector in most developing countries is underdeveloped local production often cannot meet domestic food requirements. For protectionism to be effective there is the need for long term planning to increase the level of local food production.

Market-based mode of agricultural modernisation has left farmers more exposed and less resilient to adapt to climate change (Taylor, 2015). In the agricultural modernisation narrative small holder farmers are often encouraged to engage in contract farming so as to benefit from relationships with larger scale agro-food producers, however this often establishes unequal relationships (Taylor, 2015). Farmers in such relationships are often forced to grow specialised crops which are guided by standardisation, quality controls and strict crop production schedules. Also strategies to modernise agriculture through diversification often leads to diversification into high value crops which may lead to the production of specialised crops (Rigg and Oven, 2015). Specialisation narrows the agricultural system often creating a potential double risk exposure where risks associated with natural hazards also interact with market risks (Leichenko and O'Brien, 2008; O'Brien, Leichenko, et al., 2004; Taylor, 2015). Small holder farmers become relatively less self-sufficient and more dependent on non-local markets and distant trade relations. Also, the growth of a particular crop by several farmers in the same place, as well as the use of the same agro-chemicals increases the risk of the spread

of pests that are immune to these technologies. This also makes farmers more dependent on input producers who disseminate new technologies as solutions to these problems (Taylor, 2015). They often incur debts in trying to buy these technologies and also face the challenge of having to learn to use these new technologies.

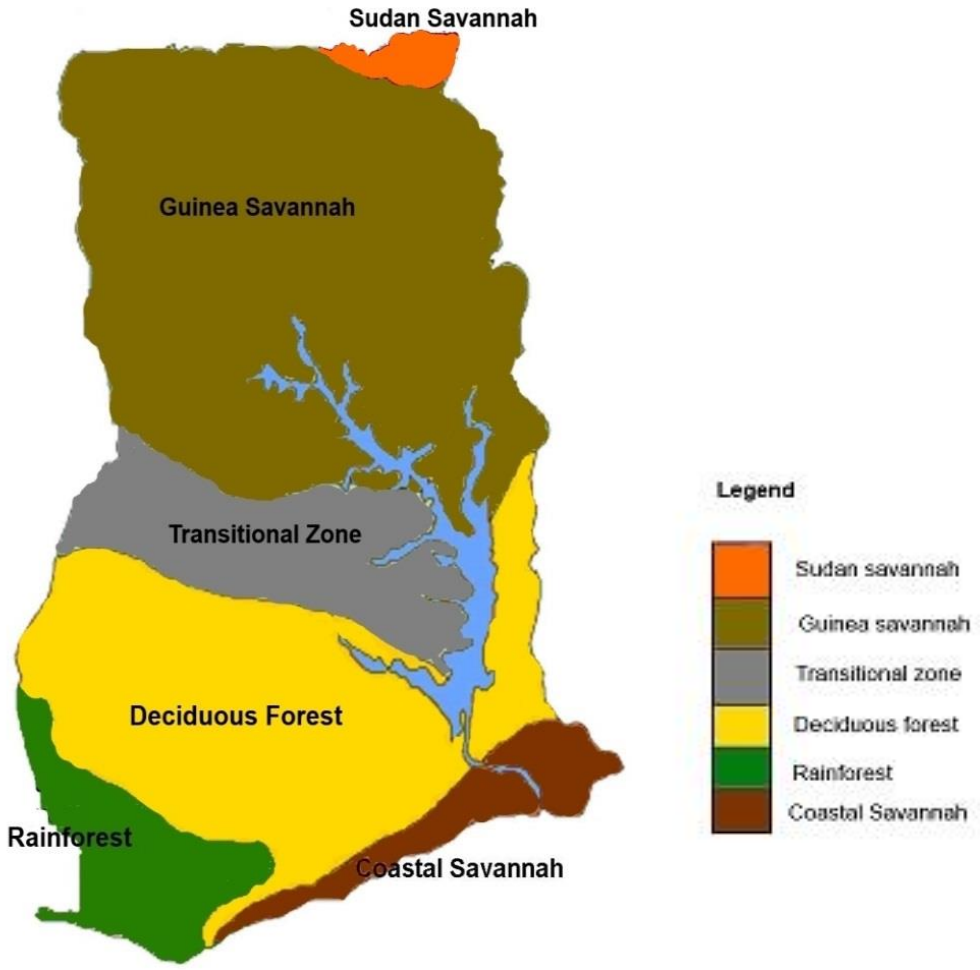
2.5 Understanding Vulnerability and Impacts to Climate Variability and Change in Ghana

Vulnerability to the impacts associated with climate change and variability in Ghana is socially and spatially differentiated. Vulnerability differs both by ecological zones (Fig 2.1) and socio - economic groups. Each of the six ecological zones[3] in Ghana i.e. the Sudan, Guinea, Transitional, Deciduous Rainforest, Rainforest and the Coastal Savannah have been identified to have specific physical and socio-economic characteristics that define their sensitivity and resilience to climate change impacts. The socio-economic groups identified to be affected most by climate change and variability include small-scale food crop farmers, women small-scale farmers, migrant farm workers, livestock operators, slum dwellers, fishermen and fishmongers. Vulnerability to the impacts associated with climate change and variability in Ghana are shaped by broader social, political and economic processes. These groups are vulnerable largely because of unequal power relations, limited access to resources and decision making structures, existing legal frameworks and market imperfections (NCCAS, 2012; NCCP, 2013).

Food crop farmers for instance have limited access to resources like land, irrigation infrastructure and essential farm inputs which play a major role in exacerbating their vulnerabilities to climatic impacts. Amongst the fishers, overfishing stemming from illegal, unregulated and unreported fishing have led to a decline in fish stocks and consequently a reduction in fish supply and increased cost of fish. Slum dwellers / the urban poor on the other hand engage in informal and precarious work arrangements often associated with low wages and unsafe working environments. They also live in and occupy unsafe land and have limited access to basic services these factors increase their vulnerabilities to climate change and variability.

[3] These can further be grouped into the Northern Savannah (Guinea and Sudan Savanna), Forest Zone (Deciduous and Rainforest), Transitional zone and the Coastal savannah.

Figure 2.1 Map of the Ecological Zones in Ghana



Source: *Author*

In Ghana climate change has impacts on major socio - economic sectors of the economy such as agriculture, fisheries, health, sanitation, water, energy, infrastructure and natural resources (NCCAS, 2012). The interplay of existing vulnerabilities with climate impacts exacerbates vulnerability levels and reduces adaptive capacities. The IPCC AR5, reports at high confidence that climate change will interact with non-climate drivers and stressors to exacerbate vulnerability of agricultural systems and this will have strong adverse effects on food security. It will also intensify existing stress on water availability in Africa (high confidence) as water resources are subject to high hydro-climatic variability. In West Africa, temperature increases above 2° C are estimated to counteract positive effects on millet and sorghum yields. It has also been projected that by 2050 the annual landed value of fish for West Africa will decline by 21%, this will result in a nearly 50% decline in fisheries-related employment and a total

annual loss of USD 311 million to the region's economy (IPCC, 2014). As electricity in Ghana is mainly provided from hydro-electric sources, stress on water availability is likely to also affect the total amount of electricity generated (NCCAS, 2012).

The frequency and duration of cholera outbreaks in Ghana and other West African countries have been linked with heavy rainfall which could be associated with the El Niño-Southern Oscillation (ENSO). Also, projected increases in precipitation in West Africa will possibly lead to more frequent cholera outbreaks in the sub-region (IPCC, 2014). High ambient temperatures have also been associated with increased mortality in Ghana and other West African countries. There is also a strong environmental relationship between the seasonal pattern of the harmattan[4] dusty winds and the onset of disease (IPCC, 2014). The IPCC AR5 reports that sea level rise along coastal settlements in Africa could disrupt economic activities such as fishing and tourism. In Ghana sea level rise is projected to exacerbate shoreline recession, inundation of low-lying coastal areas, damage to human settlements and infrastructure as well as increasing the salinity of estuaries and aquifers. The livelihood of fishermen, fishmongers and farmers living along the coast could be adversely affected (NCCP, 2013; World Bank, 2011).

2.6 Relationship between Vulnerability and Resilience

The IPCC defines resilience as the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change (IPCC, 2007a: 880). The uncertainties associated with climate change provides a condition to build resilience. Building resilience requires anticipating within uncertainty, across scales or within a system. Changes in climatic trends and changes in the nature or magnitude of the impacts of shocks has made it more difficult to anticipate specific climate impacts with certainty. The inability of local communities and models to accurately predict or forecast climatic changes negatively impacts on decision - making processes. Changes in climatic trends may be beyond the coping capacity of an affected group, they may no longer be able to depend on local strategies developed on

[4] A dry, dusty north-easterly trade wind that blows from the Sahara Desert in North Africa towards the West African coast between the months of December – March.

historic experiences. Uncertainty influences successful adaptation, there is therefore the need to strengthen the adaptive capacity of communities, households and individuals for projected changes.

The main converging points between vulnerability and resilience research is their focus on the shocks and stresses experienced by the social-ecological system, the response of the system to perturbations, and the capacity for adaptive action (Adger, 2006: 269)**.** There are however diverging points between vulnerability and resilience. Joakim et al., (2015) argue that vulnerability perspective provides an understanding of the social, economic, historical, cultural and political processes that lead to increased risk, whereas the resilience perspective explores the opportunities for moving forward and reducing the impacts of shocks and stresses associated with climate change. Other authors like Béné, et al., (2012) contend that resilience transfers an ecological, systems-based concept of being self-regulating or rational onto socially constructed contexts. Consequently, it does not adequately capture or reflect social dynamics such as agency and the relations of power that produce and sustain vulnerability. The Resilience perspective ignores the agency of people by focusing on the ability of the system to recover from shocks rather than the choices exercised by individuals within the system. The focus on individualism, self-sufficiency, self-organization has the tendency to shift the responsibility of governments to individuals, households and communities and to blame marginalized groups for the vulnerabilities they experience. The diversion of attention from the underlying causes of vulnerability could lead to the proposal of technical, apolitical interpretations and solutions which would entrench existing social structures that produce unequal risk.

2.7 Decision Making and Climate Change Uncertainty

Africa is considered one of the most vulnerable continents to climate variability and change because of multiple stresses and low adaptive capacity. West Africa is expected to be strongly impacted by temperature increase. Climate models show that the projected temperature rise in West Africa is very likely to exceed the 1986 - 2005 baseline[5] of approximately 0.61°C (range

[5] The IPCC used various baselines to project and compare future warming. They sometimes compared future warming with pre-industrial levels, from 1850 -1900 and sometimes compared it with the average temperature

of 0.55°C to 0.67°C) by between 3 and 6 °C across the region by the end of the 21st century (IPCC, 2013). Rainfall over the Sahel has decreased over the course of the 20th century however there is low to medium confidence in projected precipitation change in West Africa. Many of the models used in projections indicate a wetter core rainfall season with a small delay to rainy season by the end of the 21st Century in West Africa (IPCC, 2013).

In Ghana, there have also been several studies to predict the impacts of climate change. Predicted impacts vary according to the global circulation model that is used in a study. However most of the models generally agree that the mean annual temperature in Ghana will increase by 1.0 to 3.0°C by the 2060s, and 1.5 to 5.2°C by the 2090s with sea level rising at 5.8 cm, 16.5 cm and 34.5 cm by 2020, 2050, and 2080, respectively. Total annual rainfall is projected to decline by 1.1%, and 20.5% in 2020 and 2080, respectively. On the whole, Ghana is projected to become hotter and wetter during the wet season and drier during the dry season, with increased sea level rise and storm surges (World Bank, 2011).

The variation in climate projections from climate models often makes it difficult to quantify potential future impacts on development. Policy makers cannot easily assess future impacts of climate change neither can they predict with certainty the future conditions to which adaptation is needed (Adjei-Nsiah and Kermah, 2012; Codjoe et al., 2011; De Pinto et al., 2012; World Bank, 2011). However scientific uncertainties should not prevent policy makers from making decisions to address climate change impacts. Policy makers can respond to uncertainties by using projections to take precautionary measures to prevent or minimize the impact of climate change on sectors that have been identified to be vulnerable. In Ghana although climate projections have been outlined in some national policy documents they have not been actively used by policy makers to prevent or minimize the impacts of climate change on vulnerable sectors.

According to Dessai and Wilby (2011) decision makers can incorporate climate change uncertainty into long-term planning by first acknowledging uncertainties. This is then followed

from 1986-2005.Temperatures from 1986-2005 is approximately 0.61 (0.55 to 0.67) °C warmer than 1850 -1900. Temperatures in 2012 were 0.85 °C warmer than pre-industrial levels.

by a framing of the problem. Problems could be framed either as predict-then-act or assess-risk-of-policy. The way in which the problem is framed determines the tools that are used for analysis and how uncertainty is addressed. A predict-then-act framing emphasises on characterising and reducing climate change uncertainties before decisions can be taken. However, with the assess-risk-of-policy framing decisions are made before uncertainties are assessed. When using the assess-risk-of-policy framing to address uncertainties decision makers together with stakeholders will have to determine the strategies, plans or policies that could be implemented. They will then come up with agreed criteria (economic, social, and environmental) for the things that are valued, and characterise uncertainties and drivers of change that are associated with them. To characterise uncertainties in a context where data is limited Dessai and Wilby suggest comparing strategies qualitatively by using narratives of projected changes to explore the uncertainties in key drivers. In places where there is access to data, quantitative models can be used to assess the importance of different strategies. Advanced techniques, such as robust decision-making could help visualize a strategy performance against multiple uncertainties and multiple criteria. This will allow decision makers to evaluate different trade-offs and to also identify "low – regret"[6] measures which will enhance resilience and reduce vulnerability of socio-ecological systems to climate and other uncertainties.

In Ghana climate adaptation to a large extent is being framed in terms of "assess-risk-of-policy". In the National Climate Change Policy document for instance, uncertainty is acknowledged but not considered a limitation to taking action. The document states that because of uncertainties policy decisions should be robust enough to withstand many different climate change scenarios. Policy decisions made should be supported by rigorous evidence, useful for assessing the potential opportunities, constraints, and limits of the portfolio of options available. The document also states that policy decisions that are made need to be supported by effective implementation measures as well as monitoring and reporting systems (NCCP, 2013: 12–13). The IPCC AR5 reports at high confidence that given multiple uncertainties, Africa needs to build resilience to ensure successful adaptation. The increasing

[6] Adaptation actions are often associated with opportunity costs and trade-offs so it is better to refer to interventions as "low regret" instead of "no regret" strategies.

rate of observed impacts of climate change as well as uncertainties about future impacts require that appropriate adaptation measures be put in place to help minimize climate change impacts.

2.8 Adaptation to Climate Change

Adaptation to climate change refers to the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001: 365). It is particularly required in developing countries because of high levels of exposure and vulnerability to climate change impacts (IPCC, 2007a; Mertz et al., 2009). The term 'Adaptation' is sometimes used interchangeably with 'coping', however these two terms have different characteristics. The main distinction between coping and adaptation strategies is in relation to time scale. Coping strategies provide short-term and immediate responses to unexpected events whilst adaptation strategies provide long-term and planned responses to expected or future uncertainties. Fabricius et al., (2007) distinguish between coping and adaptation strategies based on time-frame, aims, response types and learning. They characterize coping strategies as short-term and immediate strategies oriented towards survival to unexpected climatic events. They are often reactive and opportunistic responses. The opportunity for learning when using coping strategies is limited as it is mainly through individual experiences and innovation. Adaptation strategies on the other hand are long-term strategies that evolve over generations. They are oriented towards both survival to expected or future uncertainties and sustainable management of socio-ecological systems (SES). They are often proactive and planned responses which provide extensive opportunity for learning through knowledge exchange, intergenerational transfer and institutional development. Morton (2007:19681) argues that it is often difficult to distinguish between coping and adaptation strategies. What may have started as a coping strategy in exceptional years can become adaptation strategies for households or whole communities.

Adaptation strategies can be broadly categorized based on their purpose, timing, the agents involved and the temporal scope. In relation to purpose there is autonomous and planned adaptation. Autonomous adaptation is a spontaneous response to climatic stimuli whereas deliberate interventions are made in planned adaptation (Fankhauser et al., 1999; Huq et al., 2003). The agents involved in an adaptation strategy could be either private / public and on the temporal scope adaptation can either be short or long term (Huq et al., 2003). With regards to

timing there is the anticipatory approach to adaptation which seeks to reduce a systems exposure to future risks whereas reactionary approach aims only to alleviate impacts after they occur (Burton et al., 2006; Huq et al., 2003). The adaptation strategies employed by individuals or communities are largely influenced by the institutions and resources they have access to.

Pelling (2010) points out that the way in which the climate change problem is framed will influence the adaptation response that will be implemented. Where vulnerability is attributed to proximate causes such as unsafe buildings and inappropriate land use, adaptation will be framed as a local concern and will therefore be approached with an incremental view of adaptation. However, if vulnerability is framed as an outcome of wider socio-political processes and our relationship with the environment then transformational responses become relevant. Whilst incremental adaptation involves doing slightly more of what is already being done to deal with climate change and extreme weather events (Kates et al., 2012: 7156), transformational responses require a more intensive approach. These include innovation, applying an existing activity at a greater scale or intensity, transforming places and shifting locations, re-organising or re-orienting institutional and social structures in order to increase adaptive capacity and resilience (Few et al., 2016; Kates et al., 2012; O'Brien, 2012). Perceived costs of transformational actions, institutional and behavioural barriers as well as the uncertainties inherent in climate change projections often pose a challenge for planning and implementing long-term transformational responses.

In Ghana, adaptation responses at the community level have been mostly incremental and short-term as compared to long-term transformative responses. O'Brien (2012) notes that transformational responses have been given less attention because it often challenges the status quo (existing political and social structures), threatening stakeholders who benefit from current systems and structures. The National Climate Change Policy acknowledges the challenge of uncertainties and states that to address this challenge, policy decisions should be robust enough to withstand many different climate change scenarios. Although stated on paper this is often not achieved in practise. Considering the increased rate and magnitude of climate change impacts in the country broader transformation will be required if vulnerability is to be addressed more substantively and robustly. This will include the provision of affordable settlements and the existence of more lucrative, secure livelihood opportunities.

2.8.1 Gendered Impacts and Responses to Climate Change

Both men and women are affected by climate change impacts, however women tend to be affected more adversely than their male counterparts because of political and socio - economic conditions (Arora-Jonsson, 2011; Singh et al., 2010). Politically women are under represented at the various levels in the decision-making process consequently their concerns are often not adequately incorporated into climate initiatives and agendas. Incorporating the concerns of both men and women is crucial for the implementation of appropriate adaptation measures. Women often have vast knowledge and experience of coping with the impacts of climate change. They can therefore provide relevant information that can enhance climate adaptation interventions. Their under representation during the decision making process often undermines the effectiveness of climate change responses and aggravates gender inequalities (Brody et al., 2008; Denton, 2002).

Access to capital assets is essential for effective adaptation to climatic impacts. In most societies gender inequalities exist in the access and use of resources. Limited access to resources influences the options and safety nets available to men and women to deal with climate change impacts (Singh et al., 2010). Denton (2002) argues that unequal power relations between men and women leads to differential access to environmental resources which affects livelihood diversifications and consequently vulnerability levels (Denton, 2002). In Ghana women constitute 52% of the agriculture labour force and produce 70% of total food production. In addition, they undertake 85% of food distribution (ADF, 2008), and contribute 46% to the total agricultural GDP. Their increased access to and control of land could lead to higher productivity levels. In Ghana, women generally acquire land through inheritance, marriage or contractual arrangements. About 80% of the land in Ghana is managed by customary laws which sometimes discriminates against women (ADF, 2008). Upon the death of a spouse or after a divorce women could easily lose the ownership or user rights of a land (ADF, 2008).

Women often engage in unpaid work because of socially constructed gendered roles. They are usually assigned the supportive role of caring for the family and they undertake the reproductive role of bearing and raising children. Men on the other hand engage in productive

roles in the public sphere for which they earn wages. They are therefore the main providers for the family and tend to dominate decision making in the home. Women's inability to earn a wage by engaging in productive work affects their decision-making abilities as well as their ability to access resources that can help them respond adequately to climate change impacts (Brody et al., 2008; Singh et al., 2010).

Again, because of the gendered division of labour, women's workload tends to increase when a natural hazard occurs. Ghanaian women spend more than twice as much time on domestic work as men (WEDO, 2008). During periods of drought or floods they are likely to spend even more time collecting water or queuing for water supplies. Also after floods they are likely to be burdened with the task of having to clean and maintain the home. This is time that could be spent in school, earning an income or participating in public life (Brody et al., 2008; Nelson et al., 2002).

Existing gender norms could increase death rate amongst either men or women. Socially embedded notions about masculinity can encourage risky, 'heroic' action in a disaster situation consequently increasing death rates for men as in the case of Hurricane Mitch which hit Honduras in 1998. These notions could also constrain female mobility as women wait to be granted permission from male household heads in order to exit homes during disasters, this was the case during the 1991 cyclone floods in Bangladesh (Arora-Jonsson, 2011).

Lack of education and access to information can also influence how men and women are able to respond to changes in climate conditions. Structural constraints could restrict the kind of information that reach men and women. For instance during the 1991 cyclone flood in Bangladesh the death rate was almost five times higher for women than men because warning information shared amongst men in the public spaces did not reach their families (Singh et al., 2010). When people do not have access to public information system (early warning systems) they are more likely to be adversely affected by climate change impacts.

Having recognized the gendered impacts to climate change, specific vulnerabilities of men and women have been identified in national policy documents and adaptation programmes. Actions have been outlined to address these vulnerabilities and to improve adaptive capacities of both men and women. Policies that incorporate a gender analysis or perspective aim to avoid

exacerbating gender inequalities and promote gender equity (Alston, 2014; Nelson et al., 2002).

2.8.2 Adaptation at the Local Level

In Ghana adaptation options chosen at the local level are often straightforward, simple, practical actions that counter or reduce impacts (Yaro, 2010: 52). Dominant adaptation measures deployed by households in Ghana in response to climate change and variability include livelihood diversification, crop diversification, migration, planting drought-tolerant crops, cultivation of upland crops, constructions of wells and boreholes, water harvesting (Carr, 2008; Codjoe et al., 2011; Tschakert et al., 2013). Local adaptation practice in Ghana is often based on indigenous knowledge (Gyampoh and Asante, 2011), varies from zone to zone, (Dumenu et al., 2013; Gyampoh and Asante, 2011; Yaro, 2010) and varies according asset holding level and livelihood group (World Bank, 2011).

Agriculture in Ghana is highly dependent on rainfall consequently droughts, floods and heavy rains have a significant impact on crop yields and food security. Small-scale farmers who account for about 80% of domestic agricultural production tend to be adversely affected by climate change impacts. They have relatively low adaptive capacities because of their limited access to resources like land, irrigation infrastructure and essential farm inputs. Their access to adequate training and technical support from agricultural extension services is also limited. The adaptive strategies of small scale farmers include livelihood diversification, crop diversification, planting drought-tolerant crops, changing planting dates and migration.

In informal communities' the interplay of climate change with existing vulnerabilities leads to an increase in the incidence of diseases like cholera and malaria, decreased food security as well as decreased water availability and quality. Floods also destroy infrastructure and property in these communities. Slum dwellers usually have low adaptive capacities because of high poverty levels, inadequate health and sanitation facilities as well as limited access to emergency response. These communities adapt to climate change impacts by harvesting and storing rain water, elevating makeshift structures and diversifying livelihood sources.

As a result of climate variability and change and other factors like overfishing stemming from illegal, unregulated and unreported fishing, fishing communities are experiencing a decline in

fishing stock and consequently a reduction in fish supply and increased cost of fish. In Ghana marine fisheries provides about 75% of annual total fish production (Agrer, 2011). Extreme weather events have led to a disruption in fishing patterns which has resulted in decreased income security for fisher folk. Fishing communities also experience coastal erosion and floods which destroy infrastructure. Fisher folk have relatively low adaptive capacities because of high poverty levels, inability to access credit and existing legal frameworks governing fishing. To adapt to the impacts of climate change fisher folk are diversifying their income sources and they also migrate seasonally or permanently (Tanner et al., 2014).

Although individuals and communities in Ghana have shown the ability to adapt to climate change and variability in the past their ability to adapt effectively to current and future climate change will be influenced largely by the institutional and economic environment. Institutional and economic parameters affect the vulnerability and adaptive capacity of societies. Also the effective implementation of adaptation is often impeded by technological, financial, social and cultural constraints (IPCC, 2007a). There is therefore the need for public policy to create the right environment for the implementation of appropriate adaptation measures to climate change (Fankhauser et al., 1999). Effective adaptation strategies should reduce present vulnerability as well as future vulnerability to climate change (Huq et al., 2003).

2.8.3 Existing Adaptation Frameworks in Ghana

This section presents and broadly discusses some of the existing policies and frameworks guiding climate change action in Ghana. It also discusses the stakeholder process. Adaptation policies that impinge directly on the vulnerability of the communities studied in this thesis will be analysed in subsequent chapters.

To systematically and effectively address the impacts of climate change there is the need to put in place a comprehensive framework or policy. Adaptation frameworks provide a context and guidance for implementing specific adaptation measures. They also provide an opportunity to introduce measures that can effectively address anticipated impacts. Effective adaptation policies are likely to strengthen adaptive capacity, build resilience and reduce vulnerability to the impacts of climate change at various levels in the society. In Ghana, some of the existing policies and frameworks guiding climate change action include:

- Ghana Shared Growth and Development Agenda, 2010-2013 (GSGDA), 2010
- Ghana Shared Growth and Development Agenda, 2014-2017 (GSGDA), 2014
- National Climate Change Adaptation Strategy (NCCAS), 2012
- National Climate Change Policy (NCCP), 2013
- National Climate Change Policy Action Programme for Implementation: 2015–2020
- Food and Agriculture Sector Development Policy II (FASDEP II), 2007
- Medium-Term Agriculture Sector Investment Plan (METASIP), 2010
- National Climate-Smart Agriculture and Food Security Action Plan (2016-2020,) (CSA Action Plan), 2015
- National Urban Policy Framework (NUP), 2012
- National Urban Policy Action Plan, 2012
- National Land Policy, 1999

The **GSGDA** was developed by the National Development Planning Commission (NDPC) in 2010. It is a Medium-Term National Development Policy Framework. The GSGDA reports findings from poverty studies in Ghana which show that poverty levels have increased in the predominantly food crop producing and fishing communities whilst reducing in the forest zones and cocoa producing communities of the country. There is therefore an attempt to address the situation in this document. In this framework climate change is identified as a major threat to national development, and adaptation is considered the principal way to address the potential impacts of climate change. Adaptation to climate change is addressed as a cross-cutting issue covering the private sector, natural resource management, disaster risk reduction, recreational infrastructure, water resources and energy (GSGDA, 2010; IISD, 2011). The framework outlines 10 strategies that will be used to reduce vulnerability and enhance adaptation to climate variability and change in Ghana. See table 2.1 below for a list of strategies to reduce vulnerability in existing adaptation frameworks.

The **NCCAS** was developed by the Environmental Protection Agency with support from UNEP/UNDP and the Danish Ministry of Foreign affairs and was published in 2012. Factors that influenced the preparation of this document include the nation's commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Hyogo

Framework for Action (HFA) 2005-2015. In addition to meeting these international commitments, national vulnerability and adaptation assessments which revealed the nations sensitivity and exposure to observed and projected impacts of climate change influenced its preparation (NCCAS, 2012). It was also prepared to help the country meet its international obligations and to position the country to draw funding to meet national adaptation needs (NCCAS, 2012). The main goal of this strategy is to enhance Ghana's current and future development to climate change impacts by strengthening its adaptive capacity and building resilience of the society and ecosystems**.** It recognizes the need for strengthening the relationship between scientific and indigenous knowledge in the strategies listed for adapting livelihoods and agriculture to climate impacts. It also outlines the 10 priorities listed in the GSGDA and advocates that these priorities should be mainstreamed into development projects and programs to facilitate implementation and to ensure support at various levels, national, regional and international. (IISD, 2011; NCCAS, 2012). The NCCAS identifies small-scale food crop farmers, women small-scale farmers, livestock operators, slum dwellers, migrant farm workers, fishermen and fishmongers, as those affected severely by climate change impacts. It indicates that adaptation interventions should commence with the most vulnerable groups and would later be scaled up to other groups.

The NCCP prepared by MESTI also aims at achieving the objectives of the GSGDA. This policy aims at ensuring a climate-resilient and climate-compatible economy while achieving sustainable development through equitable low-carbon economic growth. Social development, mitigation and effective adaptation are outlined as the policy's main objectives. This document notes that adaptation to climate change is crucial and will help communities and nations cope with climate change impacts. Four thematic areas identified to drive the adaptation strategies include energy and infrastructure, natural resources management, agriculture and food security, disaster preparedness and response. In the NCCP women, children, the aged and the physically challenged are mentioned as groups adversely affected by climate change. The provision of social protection and social safety nets are mentioned as interventions that will help reduce inequalities and increase resilience amongst these groups.

FASDEP II and **METASIP** were prepared by the Ministry of Food and Agriculture (MOFA) to guide development and interventions in the agriculture sector. While FASDEP II is only a

statement of intent, METASIP is an investment framework for the implementation of the broad strategies detailed in FASDEP II. In these documents climate change and variability is not explicitly outlined as a constraint to development in the agriculture sector however the six programme areas, particularly the sustainable management of land and environment programme provide entry points to address climate change challenges (IISD, 2011; Sova et al., 2014). In FASDEP II it is stated that floods and droughts lead to disasters which cause severe food insecurity and disruption of livelihoods of poor smallholders, women small scale farmers and the urban poor, particularly migrant farm workers who rely mainly on agriculture for their livelihood. The policy document seeks to address the challenges of these groups. The Ministry also has a **National Climate-Smart Agriculture and Food Security Action Plan** 2016-2020 (CSA Action Plan). The document makes reference to a number of national policies. However, the policy objectives addressing Agriculture and Food Security in the NCCP constitute the key components of this Action Plan. The document highlights the prioritized needs of the various agro-ecological zones in the country. For the Savannah Zone, water conservation and irrigation systems is said to be critical. the development of livestock production system for the Transition Zone and for the Forest Zone, capacity development is considered a priority (MOFA, 2015).

The National Urban Policy Framework and Action Plan was developed under the Ministry of Local Government and Rural Development (MLGRD) with the financial and technical assistance of the German Development Cooperation (GIZ) and the World Bank. The goal of this policy is to promote a sustainable, spatially integrated and orderly development of urban settlements with adequate housing, infrastructure and services, efficient institutions, and a sound living and working environment for all people to support the rapid socioeconomic development of Ghana (NUP, 2012: 21). 12 policy objectives are outlined in this document. Some of these objectives include promoting climate change adaptation and mitigation mechanisms, improving environmental quality of urban life, ensuring efficient urban infrastructure and service delivery and improving access to adequate and affordable low-income housing.

The National Land Policy (NLP) which was implemented in 1999, aims at ensuring the judicious use of the nation's land and all its natural resources by all sections of the Ghanaian society in support of various socio- economic activities undertaken in accordance with

sustainable resource management principles and in maintaining viable ecosystems (Ministry of Lands and Forestry, 1999: 6). The policy seeks to address the challenges associated with land management in the country. Some of these challenges include: land encroachments, haphazard development which leads to environmental problems and the difficulty in accessing land for agricultural, industrial, commercial and residential development purposes due to conflicting claims to ownership. The policy has 13 guiding principles derived from both national convictions and international guidelines, agreements and conventions. The policy guideline for ensuring sustainable land use has relevance for climate change adaptation and mitigation.

Table 2.1 Strategies to reduce vulnerability in existing Adaptation Frameworks

Framework	Strategies to reduce vulnerability and enhance adaptation to climate variability and change in Ghana
Ghana Shared Growth and Development Agenda, 2010-2013 (GSGDA) 2010	• Increase resilience to climate change impacts, identifying and enhancing early warning systems • Alternative livelihoods: minimizing impacts of climate change for the poor and vulnerable; • Enhance national capacity to adapt to climate change through improved land use management • Adapt to climate change through enhanced research and awareness creation; • Development and implementation of environmental sanitation strategies to adapt to climate change • Manage water resources as climate change adaptation to enhance productivity and livelihoods • Minimize climate change impacts on socio-economic development through agricultural diversification • Minimize climate change impacts on human health through improved access to healthcare; • Demand and supply side measures on adapting the national energy system to impacts of climate change • Adapt to climate change: sustain livelihoods through enhanced fisheries resource management.
National Climate Change Adaptation Strategy (NCCAS) 2012	Reiterates the 10 priority adaptation programmes listed in the GSGDA. Adaptation strategies outlined cover Livelihoods, Energy, Agriculture, Health, Early Warning, Fisheries Management, Water and Land Use.
National Climate Change Policy (NCCP), 2013	Thematic areas identified to drive the adaptation strategies include • **Energy, Industrial and infrastructure** - Increase the country's energy security and building climate-resilient infrastructure • **Natural resources management** - Improve management and resilience of terrestrial, aquatic and marine ecosystems • **Agriculture and food security -** Develop climate-resilient agriculture and food security systems • **Disaster preparedness and response -** Build a climate-resilient society • **Equitable Social Development** – Addressing issues related to health, gender, migration, water and sanitation,
Food and Agriculture Sector Development Policy II (FASDEP II), 2007 & **Medium-Term Agriculture Sector Investment Plan (METASIP), 2010**	Programme areas to address climate change • Food security and emergency preparedness • Increased growth in incomes • Increased competitiveness and enhanced integration into domestic and international markets • Sustainable management of land and environment • Application of science and technology in food and agriculture development • Effective institutional coordination.

National Urban Policy Framework (NUP), 2012 **National Urban Policy Action Plan, 2012**	Initiatives to promote climate change adaptation and mitigation mechanisms • Intensify public information and awareness campaigns on energy conservation, climate change and mitigation strategies. • Encourage progressive reduction of hazardous substances by industry. • Promote settlement structure plans designed to achieve a high level of amenity as well as the prevention of effluent and refuse pollution. • Promote and strengthen cooperation of adjoining Metropolitan, Municipal and District Assemblies (MMDAs) in collaboration with traditional authorities and other relevant stakeholders in management of water bodies and other natural resources. • Avoid coastal zone development which affects ecologically-sensitive areas. • Impose and enforce more effective coastal zone and wetlands management regulations. • Strengthen the capacities of agencies that are charged with promoting environmental standards. • Generate public awareness on climate change and litigation strategies through mass media educational campaigns.
National Land Policy (NLP) 1999	Ensuring sustainable land use - Policy guideline relevant for climate change adaptation and mitigation • The use of any land in Ghana for sustainable development, the protection of water bodies and the environment and any other socioeconomic activity will be determined through national land use planning guidelines based on sustainable principles in the long term national interest. • All lands declared as forest reserves, strict nature reserves, national parks, wildlife sanctuaries and similar land categories constitute Ghana's permanent forest and wildlife estates, and are "fully protected" for ecosystem maintenance, biodiversity conservation and sustainable timber production. • No timber production activities shall be carried out on hill and mountain slopes of at least 30° gradient. Social and economic activities such as agriculture, mining, human settlement and other similar activities may be carried out on hill and mountain slopes provided appropriate technology is employed in each circumstance to mitigate any adverse environmental and ecological consequences. With respect to water bodies a minimum of 100 metres off the high-water mark should be declared as protected areas. • Inland and coastal wetlands are environmental conservation areas and the following uses considered incompatible with their ecosystem maintenance and natural productivity are strictly prohibited: Physical draining of wetland waters; damming of streams and water courses feeding the wetlands; human settlements and their related infrastructural development in wetlands; disposal of solid waste and effluents in wetlands; mining in wetlands. • Uses of wetlands for farming, grazing, fishing, timber production and salt-wining will be encouraged provided that such uses tend to conserve the ecosystem, biodiversity and sustainable productivity of wetlands. • Each rural or urban settlement should make adequate spatial provision for the creation, development and protection of a greenbelt. • For all construction projects in urban areas, due care should be taken to ensure the provision and maintenance of adequate tree cover to protect the environment.

2.8.4 Initiatives Related to Adaptation in Ghana

This section presents a general overview of some of the initiatives related to adaptation in Ghana. Most of the major initiatives in Ghana to reduce vulnerability to climate variability and change have been implemented by international donor institutions in collaboration with the Ghanaian government or local partners (Wurtenberger et al., 2011). These initiatives have been targeted at different sectors and regions of the country. Some national and international NGOs have also implemented a number of small and micro initiatives at the local level. Currently there is limited private sector involvement in climate change initiatives in Ghana. Some of the major initiatives that have been implemented cover agriculture, fisheries, social development and health, disaster risk management and water management.

Agriculture and Food Security

In the area of Agriculture and Food security, The Innovative Insurance Products for Adaptation to Climate Change (IIPAC) project was developed by GIZ in cooperation with the National Insurance Commission (NIC), Ministry of Finance and Economic Planning (MOFEP) and the Ministry of Food and Agriculture (MOFA) Ghana to enable the insurance sector in Ghana offer innovative and economically sustainable insurance products against the financial risks caused by extreme weather events and variable temperatures and precipitation. The project was implemented from 2009 – 2013. It was funded by the German Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) (Wurtenberger et al., 2011).

Integrated Coastal and Fisheries Governance Initiative

The Integrated Coastal and Fisheries Governance Initiative (ICFG), locally called Hɛn MPOANO (Our Coast) is a project that specifically addresses coastal and fisheries governance issues in the Western region of Ghana. It is a U.S. Agency for International Development (USAID) funded project. The project run from 2009-2013. The initiative sought to support the government in achieving its development objectives of poverty reduction, food security, sustainable fisheries management and biodiversity conservation (CRC, 2013a).

Social Development and Health

Integrating Climate Change into the Management of Priority Health Risks in Ghana is a project meant to integrate climate change risks into the health sector. It was implemented between the 2010 - 2013 The Project seeks to identify, implement and evaluate adaptations to reduce the incidence of malaria, diarrhoeal diseases, and cerebrospinal meningitis (CSM) three key diseases associated with climate change in Ghana. It focuses on strengthening technical capacities of health sector workers to manage climate change-related health risks as well as increasing the public's knowledge about these diseases. The project is funded by the GEF Special Climate and implemented by the Ministry of Health (MOH) in collaboration with UNDP Ghana Ministry of Health, United Nations Development Programme (UNDP) and the World Bank (Wurtenberger et al., 2011).

Disaster Risk Management

The UNDP together with the National Disaster Management Organization (NADMO) in 2008 started a project on 'Enhancing National Strategies for Effective Disaster Risk Reduction in Ghana. The project helped to develop early warning systems and appropriate national strategies for disaster risk reduction. It also helped to develop hazard maps and build NADMO information management systems at district and community levels. Again, NADMO with the support of UNDP invited building experts to review existing building codes and developed new building guides for the country. The Ministry of Water Resources, Works and Housing has now been mandated to enforce the implementation of these codes (Wurtenberger et al., 2011)**.**

Water Management

To improve water supply and distribution in urban centres The Ghana Urban Water Project was initiated between the year 2004 and 2012 to extend water supply to poor neighbourhoods. The project was implemented by the Ghana Water Company and funded by the International Development Association (IDA, the World Bank's fund for the poorest countries) and the Ghanaian Northern Development Fund (Wurtenberger et al., 2011).

2.9 Climate Change Policy Processes in Ghana

The response of the government to climate change in Ghana has largely been driven by international discourse and institutions around climate change (Cameron, 2011; Sarpong and Anyidoho, 2012). At the international level Ghana has engaged actively in many climate change negotiations. The country has signed all three of the Rio Conventions (climate change, biodiversity and desertification) and as of 2010 Ghana had submitted 55 Nationally Appropriate Mitigation Actions (NAMA) to the UNFCCC. In 2015 the country submitted its Intended Nationally Determined Contribution (INDC). This document outlines both mitigation and adaptation actions that the country intends to implement to address climate change. It proposes 31 programme of actions (20 mitigation and 11 adaptation programmes) which will be implemented within a ten-year period (2020-2030). The implementation of the actions are expected to help attain low carbon climate resilience through effective adaptation and greenhouse gas (GHG) emission reduction in 7 priority sectors i.e. Sustainable land use including food security, Climate proof infrastructure, Equitable social development, Sustainable mass transportation, Sustainable energy security, Sustainable forest management; and Alternative urban waste management (INDC, 2015).

At the national level, there is little evidence between documented intent and action. Climate change is largely viewed as a technical issue and has not been dealt with systemically or at the level of transformational change required (Cameron, 2011: 18). In Ghana efforts to address climate change impacts have often emphasized mitigation over adaptation largely because mitigation related activities receive more attention and funding than adaptation (Sarpong and Anyidoho, 2012).

Donors have played an important role in the formulation and implementation of adaptation policies in Ghana. They have often used financial and technical support as leverage to determine what gets on the agenda and in the policy content (Koduah et al., 2015). For instance, the prioritized climate change adaptation options in the GSGDA 2010 and NCCAS 2012 were included based on the recommendations from the Netherlands' Climate Assistance Programme (NCAP), a donor commissioned study. Under the UNFCCC, Ghana as a developing country was obliged to produce National Communications and an action plan for the implementation of the convention. The NCAP therefore provided technical and financial assistance to enhance

Ghana's capacity to fulfil their commitments to UNFCCC and to formulate and implement climate change national policies. Through this programme a series of vulnerability and adaptation assessments for different sectors (water resources, coastal zones and agriculture i.e. cereal production) was completed. (Agyemang-Bonsu, 2005; Agyemang-Bonsu et al., 2009). These studies informed Ghana's policy-making and action on climate change. Sarpong and Alhassan (2014) also explain that as donors finance a lot of the government projects and programmes their interest on particular issues have led to the initiation of policies in those areas. For instance, the focus of FASDEP II to make it more pro-poor is based on DFID's pro-poor focus in agricultural interventions. The Japanese and the Food and Agriculture Organization (FAO) have interests in irrigation systems consequently their focus on the development of the irrigation policy. GIZ focuses on extension issues and was instrumental in the National Agricultural Extension Policy (NAEP). There is currently inadequate domestic political pressure on politicians from citizens to address climate change issues. This lack of local pressure on politicians allows climate change in Ghana to be more driven in response to internationally led agendas and dominated by the interests of the few technical experts rather than linked to pressing national priorities experienced and expressed by Ghanaians themselves (Cameron, 2011; Sarpong and Anyidoho, 2012).

Although there is increased awareness about climate change within the government, this is still largely limited to specific departments and units, such as the Ministry of Environment Science Technology and Innovation, the Environmental Protection Agency and the Ministry of Food and Agriculture. The Ministry of Environment, Science, Technology and Innovation (MESTI) and The Environmental Protection Agency (EPA) are the focal point for climate change issues in the country. These organisations provide policy and technical lead on climate change issues in the country (Cameron, 2011). Within MESTI is the National Climate Change Committee (NCCC). Majority of the representatives of this committee are from the various Ministries, Departments and Agencies with a few representatives from some NGOs/CSOs, International organisations, Research institutions and the Private sector (Narasimhan, 2011). This group/committee established in 2010 was mandated to formulate the National Climate Change Policy for the country. The Ministry of Finance and Economic Planning (MOFEP) is also involved with the planning and budgeting for climate relevant activities. Within this ministry is a Natural Resources, Environment and Climate Change Unit which seeks to help raise

awareness on climate change spending in Ghana. Various Ministries, Departments and Agencies support the activities of these institutions. The Metropolitan, Municipal and District Assemblies (MMDAs) are responsible for the implementation of climate change activities at the local level. Some NGOs/CSOs and International organizations implement specific initiatives at community levels. They also engage in climate change advocacy and awareness creation amongst stakeholders. They often do this with funding from international donors. Usually the initiatives they implement support very specific themes or events (Cameron, 2011). These groups also have limited policy influence in policy processes in Ghana. However quite recently, a few of them have been able to get their representatives on the National Climate Change Committee.

In Ghana the agenda setting for policies are often initiated by relevant government ministries. Policies are often implemented after extensive consultations with stakeholders. Before implementing the policies outlined in section 2.8.3, consultation workshops were organised with government ministries, departments and agencies, local government authorities like the Metropolitan, Municipal and District Assemblies (MMDAs), NGOs, local groups and research institutions. MESTI set the policy agenda for the NCCP and coordinated to bring together all participants. As Ghana is a democratic country, policies are implemented after extensive consultations with stakeholders. The NCCP for instance is said to have gone through such a process. "Thousands of Ghanaians through a national stakeholders' workshop, non-governmental and civil society organizations (NGOs/CSOs), the traditional authorities, the Metropolitan, Municipal and District Chief Executives (MMDCEs), Members of Parliament (MPs) as well as high-level experts all made contributions to the G4 document and the draft NCCP" (NCCP, 2013: 15).

Also, in the preparation of the CSA Action Plan, stake holder workshops were organised to include relevant or interested parties in the decision-making process. There were consultation workshops with Government Metropolitan, Municipal and District Assemblies (MMDAs), Ministries, Departments, Agencies (MDAs) and research institutions. Small-scale agro-entrepreneurs, women groups and local government authorities (MMDAs) were also included. Participants were selected from the various agro-ecological zones so they could provide inputs on the core needs of the various zones (MOFA, 2015). In the preparation, review and validation

of the draft NUP stakeholder consultation workshops were held across the country with Ministries Departments and Agencies (MDAs), Regional Coordinating Council (RCCs), Municipal and District Assemblies (MMDAs), traditional authorities, professionals, technical experts, civil society groups and the private sector.

The local level has been identified as important for mainstreaming climate change adaptation mainly because climate change impacts are manifested locally affecting local livelihood and activities. Also, vulnerability and adaptive capacity are determined by local conditions. Furthermore adaptation activities are best observed at the local level (OECD, 2009). Although most adaptation strategies are aimed to address the concerns of local communities they are often not consulted in the decision-making processes. Decisions that affect local actors often take place at higher levels, such as the central government or by multilateral and bilateral development agencies. Due to their limited participation in decision making their concerns are often not incorporated into national priorities or projects, in the long run this affects their ability to adapt effectively to climate change impacts.

The review of literature in this chapter has introduced and discussed important concepts on vulnerability, adaptation and resilience. These discussions have provided a basis for the selection of an appropriate framework for examining the relationship between climate impacts and existing vulnerabilities and the role that policy plays in addressing vulnerabilities to climate impacts in the study communities. The conceptual framework used in the study will be discussed in the next chapter.

CHAPTER 3

3.0 OVERVIEW OF THEORETICAL FRAMEWORK

Following on the concepts discussed above, this chapter presents and discusses the conceptual framework guiding the study i.e. the PAR model and the Access model. Concepts that were incorporated into these models are also discussed in this chapter. These include elements of the sustainable livelihood approach, the livelihood strategies scheme and the policy processes framework.

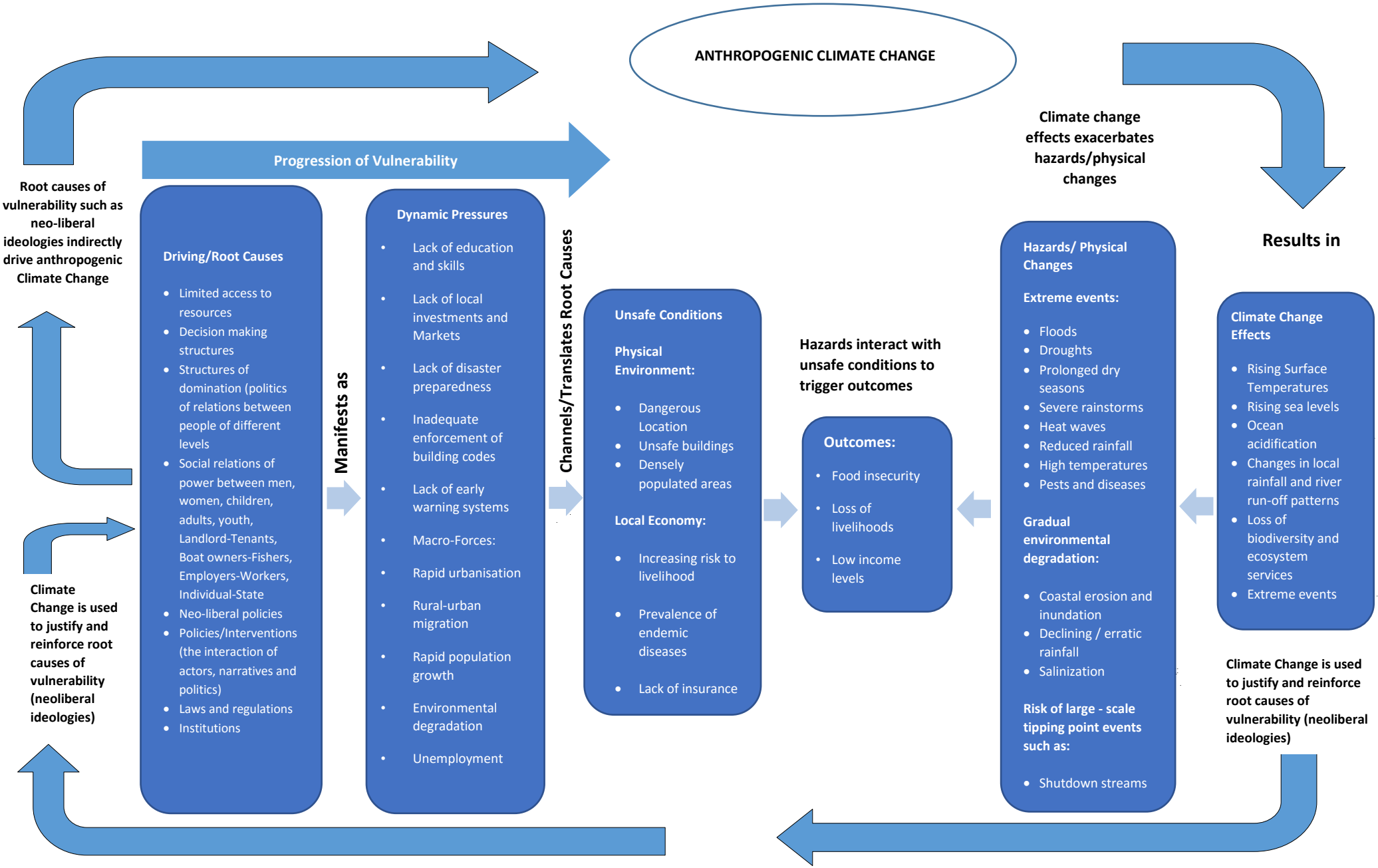
3.1 The PAR Model

The Pressure and Release Model (Fig 3.1) proposed by Blaikie et al. (1994) and updated by Wisner et al., (2004) provides an explanation for vulnerability, by tracing the progression of vulnerability from the root causes, dynamic pressures and unsafe conditions which interact with hazards to create outcomes / disastrous outcomes.

In the PAR model **root causes** are viewed as the most distant causes of vulnerability. The authors argue that economic, demographic, social and political processes are the most important root causes that give rise to vulnerability and which reproduce vulnerability over time. These processes affect the allocation and distribution of resources, among different groups of people. Root causes also reflect the exercise and distribution of power in a society. Wisner et al., (2004), explain that people who are economically marginalized tend to have less power over their physical and socio-political environments hence are more vulnerable as compared to those who hold economic and political power.

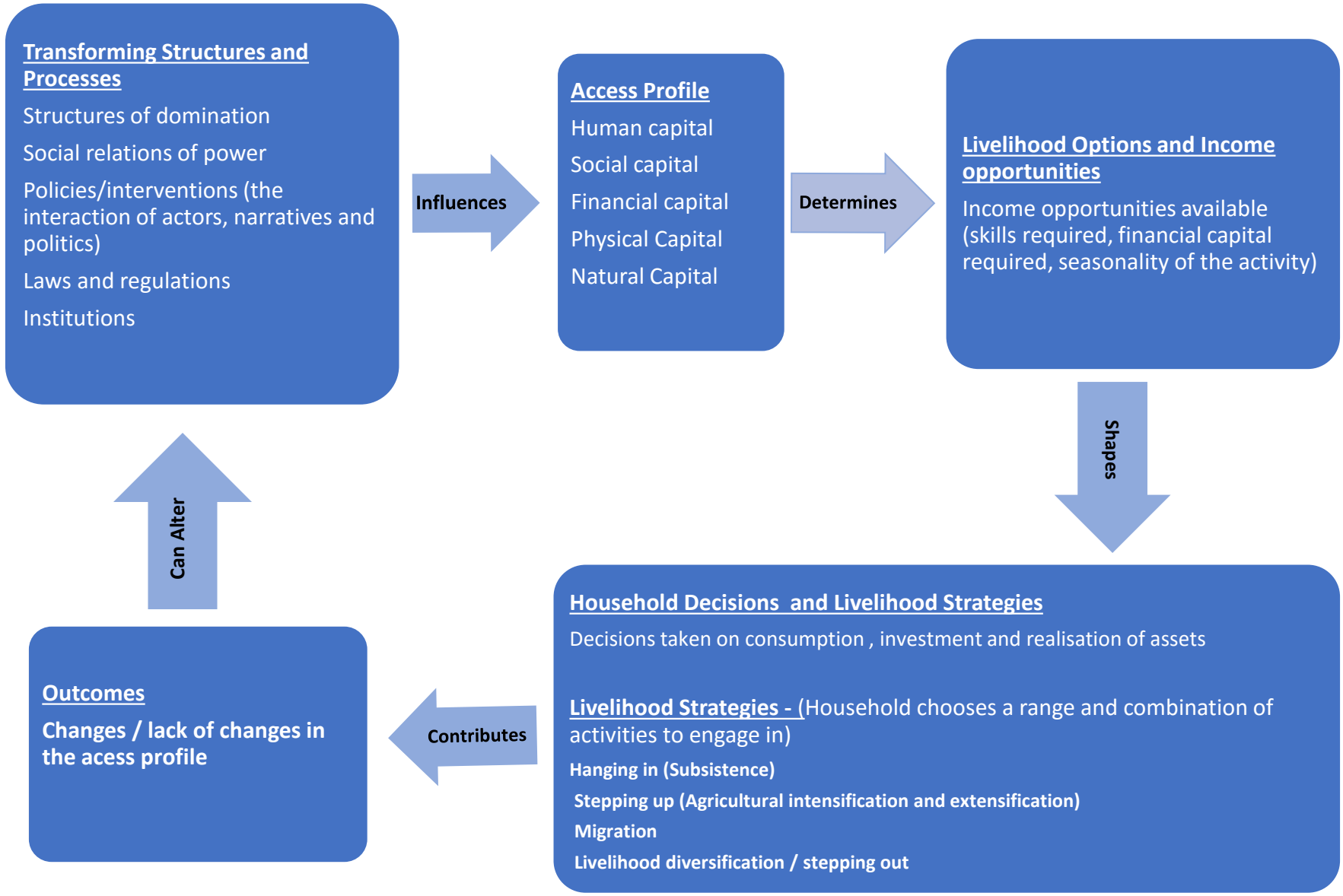
Dynamic pressures on the other hand are described as processes and activities that translate the effects of root causes both temporally and spatially into unsafe conditions. These are contemporary or immediate manifestations of underlying economic, social and political patterns. Dynamic pressures include rapid urbanisation, rural-urban migration and environmental degradation. In many developing countries, dynamic pressures like rural-urban migration arises in response to the economic and social inequalities inherent in root causes.

Figure 3.1 The Pressure and Release Model



Source: Adapted and modified from Wisner et al., (2004); Dalberg analysis, in Global Humanitarian Forum (2009); with inputs from Andrew Newsham

Figure 3.2 Incorporating components of the Sustainable Livelihood Approach (SLA) and the Livelihood Strategies Scheme into the Access Model



Source: Adapted and modified from Wisner et al., (2004); DFID, (1999); Dorward et al., (2009)

Unsafe conditions in the PAR model are the results of the dynamic pressures at the local level. They are the particular forms in which the vulnerability to hazards of a specific population is expressed. For instance, people having to live in hazardous locations, being unable to afford safe buildings and having to engage in dangerous livelihoods. The authors argue that to understand unsafe conditions it is important to consider the pattern of access to tangible resources such as cash, shelter and food stocks as well as intangible resources such as social networks and sources of assistance.

In this thesis, the PAR model has been modified to show the causal relations between climate change and socio-politico-economic processes. The PAR framework is focused on the disaster event itself but doesn't quite capture the human-environmental feedbacks of a) how the demographic, social, political and economic processes which it takes as root causes of vulnerability are fundamentally implicated in producing global environmental change and b) how the root causes of vulnerability are themselves affected by global climate change i.e. how economic production and forms of social and political organisation change in response to climate change. This is manifested in the use of resilience in ways which have 'elective affinity' with, and which actually support, the neo-liberal ideological underpinnings of contemporary global capitalism. Capturing the causal relations between climate change and socio-politico-economic processes is important as it will increase our understanding of human-environmental feedbacks and how responses to climate change affects/changes society, politics and economics.

The economic, demographic, social and political processes (root causes) that give rise to vulnerability and which reproduce vulnerability over time also indirectly drive anthropogenic climate change. Root causes such as policies to increase economic growth through increased production of goods and services is often achieved through unsustainable production methods like the burning of fossil fuels. These methods increase greenhouse gases in the atmosphere consequently driving anthropogenic climate change. Neoliberal ideologies also promote the commodification of natural resources which often leads to the over exploitation and destruction of resources depriving for instance forests of their ability to perform their function of absorbing and capturing air pollutants, hence the increase of greenhouse gases in the atmosphere. Anthropogenic climate change (caused by increased greenhouse gas emissions) physically

alters the environment resulting in climate change effects such as increased temperatures, rising sea levels and changes in local rainfall patterns.

Climate change also has the capacity to affect the social and political processes impacting vulnerability. Global climate change is being used to justify and reinforce neoliberal ideologies (a root cause of vulnerability) through the notion of resilience which is proffered as a response to the uncertainty associated with climate change. Watts (2015: 289) argues that resilience is a technology that is believed to equip individuals or communities with the capacity to deal with uncertainty and perturbation. It involves embracing risk and knowing when and how to exploit uncertainty to invent a new and better future. Watts again notes that there is an "elective affinity" between resilience thinking and the dominance of neoliberal approaches. Resilience is considered as a tool for promoting or legitimizing neoliberal ideologies (Cretney, 2014). It is best understood in the context of "rolling-out" neoliberalism (Joseph, 2013). Resilience contributes to the "Roll - out" of neoliberalism by focusing on individual responsibility and preparedness (Cretney, 2014). The idea of active citizenship is encouraged, so that rather than relying on the state, people take responsibility for their welfare, economic and social well-being. Citizens are required to familiarize themselves with possible risks and learn how to make informed decisions (Joseph, 2013). There is an assumption that communities can and should self-organise to deal with uncertainty. This assumption often provides a basis for the state to withdraw from providing social services for its citizens and encourages the privatisation of public services. Resilience is conveniently being used as a tool to perpetuate neoliberal ideologies (Cretney, 2014; Hornborg, 2009; Nadasdy, 2007; Watts, 2015). Resilience thinking focuses on individualism, self-sufficiency and market-centric approaches. It often fails to adequately incorporate relations of power, inequality and agency in the solutions it proposes to address uncertainties and perturbation. By ignoring the relations of power, the underlying causes of vulnerability are sustained, making it more difficult for poor, marginalised populations to gain access to power and resources.

Climate change effects also exacerbate hazards / physical changes which leads to extreme events such as floods, droughts and heat waves. These extreme events interact with unsafe conditions (produced from root causes) to worsen climate related impacts that people are already exposed to. For instance, drought conditions will interact with densely populated areas

to further reduce households access to clean drinking water. Floods will also damage properties and cause loss of lives of households living in dangerous locations or in unsafe buildings. Severe rainstorms will contaminate drinking water sources and increase disease-carrying insects such as mosquitoes and houseflies which worsens endemic diseases like malaria and diarrhoea.

Climate change effects are also manifested through gradual environmental degradation such as coastal erosion and declining / erratic rainfall. It could also lead to large - scale tipping point events such as the shutdown of streams in the future which would have adverse impact on water supply. When hazards interact with unsafe conditions it triggers disastrous outcomes such as loss of livelihoods, food insecurity and low-income levels.

3.2 The Access model

The thesis also draws on the Access model (Fig 3.2) by Wisner et al., (2004) to provide an explanation of vulnerability at the community and household levels. The Access Model was developed to address some of the limitations and criticisms of the PAR model. One of these being that, in the PAR model hazards are separated from social processes in order to emphasize the social causation of disasters. To avoid the false separation of hazards from social systems, Wisner et al., (2004) proposed the Access model. This model focuses on the way unsafe conditions arise in relation to the economic and political processes that allocate assets, income and other resources in a society. The model also allows nature to be integrated in the explanation of hazard impacts, by showing how social systems create the conditions in which hazards have a differential impact on various societies and different groups within society.

The Access model focuses on the precise detail of what happens at the pressure point between the natural event and longer-term social processes (ibid: 87). It is a complementary model that details the progression of vulnerability to (and through) the pressure point, and through the unfolding of the disaster (ibid: 88). Like the PAR model, it does not show how environmental externalities like climate change, generated by particular socio-politico-economic dynamics, feedback and impact not just on people in the midst of a 'pressure point', but also on the longer-term socio-politico-economic processes that they consider as root causes. The modified PAR model (Fig 3.1 above) addresses this limitation and it will be used together with the Access

model in this study to capture how the root causes of vulnerability i.e. the social, political and economic processes which drive vulnerability are fundamentally implicated in producing global environmental change and how the root causes of vulnerability are themselves affected by global climate change.

The Access model looks particularly at how individuals and households manage their access to assets and resources under structures of domination and social relations of power. **Social relations of power and structures of domination** are central in determining a household access profile, income opportunities and choices as well as their decisions and livelihood strategies. Different social groups have different levels of vulnerability. The social relations of power and structures of domination that exist in a society have a very significant role in determining who is most at risk from hazards. It determines where people live and work, and in what kind of buildings they live in, their level of hazard protection, preparedness, information, wealth and health. In this framework, social relations of power and structures of domination are placed under the broad heading **"Transforming Structures and Processes".** The Access model in isolation does not directly incorporate political factors although when used with the PAR model it provides some link with political and socio-economic processes (Wisner et al., 2004: 98). To directly incorporate political factors into the access model, the study adapts transforming structures and processes from the SLA. **Transforming Structures and Processes** are the institutions, organizations, policies, rules that regulate access to assets, markets and power relations in society as well as legislation that shape livelihoods. They determine access (to various types of capital, to livelihood strategies and to decision-making bodies and sources of influence); the terms of exchange between different types of capital; and returns (economic and otherwise) to any given livelihood strategy. Transforming processes like policies could either undermine or support livelihood strategies.

The livelihood aspect of vulnerability is also developed in the Access model. The model analyses the ability of people to deal with the impact of the hazards they face in terms of what level of access they have (or do not have) to the resources needed for their livelihoods before and after a hazard's impact**.** The access to all the resources that each individual or household possesses is defined by Wisner et al., (2004) as the **Access profile.** Access involves the ability of an individual, family, group, class or community to use resources which are directly required

to secure a livelihood in normal times, and their ability to adapt to new and threatening situations. Access to resources is always based on social and economic relations. Individuals and households are not equally able to access resources and opportunities and this influences their exposure and ability to adapt to hazards. In the Access model, resources and assets are discussed broadly without any specific categorisation. The SLA on the other hand provides a more organised classification of assets which is useful for a holistic analysis of the assets available to a household. The study therefore adapts and incorporates the SLAs classification of assets in this framework.

The SLA identifies five capital assets upon which livelihoods are built. Most livelihoods are built on the five core capital assets (DFID, 1999). Access to capital assets determines what livelihoods households will engage in. It also plays a vital role in defining the strategies that households or communities use to respond to climate variability and change consequently influencing their vulnerability levels (Adger and Kelly, 1999). Having access to assets can help decrease vulnerability considerably. Five core capital assets upon which livelihoods are built include the human, social, physical, natural, capital and financial capital. It enables people to adopt different livelihood strategies and to achieve livelihood outcomes (Bebbington, 1999; Carney et al., 1999; Scoones, 1998).

Human capital comprises the skills, knowledge, good health that enables people to pursue different livelihood strategies and achieve their livelihood objectives. **Social capital** represents the networks, relationships of trust, reciprocity and exchanges that provide some form of informal safety nets in a community. **Natural capital** consists of the natural stocks and flows and other environmental resources such as land, water and forests. Natural capital is highly sensitive to shocks and seasonality caused by natural processes. **Physical capital** comprises the basic infrastructure and producer goods (tools and equipment that people use to function more productively) needed to support livelihoods, such as affordable transport, secure shelter and buildings, adequate water supply and sanitation and access to information. **Financial capital** includes available stocks (cash, bank deposits or liquid assets such as livestock and jewellery personally owned) and regular inflows of money (labour income, pensions, or other transfers from the state, and remittances, which are mostly dependent on others).

Access profile determines **livelihood options and income opportunities** available to a household. Households choose a range and combination of activities to engage in. Households who possess access qualifications for a large number of income opportunities have a wide choice and can choose those with high payoffs or low risks. Some income opportunities have high access qualifications they could be capital intensive or require specialized skills this prevents most people from taking them up consequently, they provide the highest returns. Income opportunities that are less demanding such as casual labouring, which requires only an able-bodied person available at the point of employment are usually over-subscribed and poorly paid. Those whose access profiles are limited usually have little choice in income opportunities, and have to seek the most over-subscribed and lowest paying options. They often engage in seasonal activities and therefore have to combine a number of income opportunities at different times of the year.

The livelihood options and income opportunities available to a household **shapes the household decisions and livelihood strategies**. The household makes decisions on consumption, investment and realisation of assets. Livelihood strategies are the key to understanding the way people cope with or adapt to hazards (Wisner et al., 2004: 80). Livelihood strategies, is defined by DFID as the range and combination of activities and choices that people make/undertake in order to achieve their livelihood goals / outcomes this includes productive activities and investment strategies, reproductive choices (DFID, 1999). It is examined by identifying the activities people will engage in given a set of assets. A livelihood strategy describes a person's or people's decisions through choice or circumstances to rely on a particular set or mix of assets and activities for their current livelihood, and their intention to use that mix of assets and activities to maintain and enhance their livelihood or their children's livelihoods in the future (Dorward et al., 2005: 28).

The Access model discusses the responses (coping and adaptive strategies) employed by households to adverse circumstances in general. It does not analyse the livelihood strategies that are pursued by particular social groups. To be able to analyse the livelihood strategies that are pursued by specific social groups, the livelihood strategies scheme by Dorward et al., (2009) is incorporated into the framework. The livelihood strategy scheme provides a classification useful for explaining the kind of livelihood strategies particular social groups can

pursue to respond to the various changes around them and to maintain their livelihoods. Dorward et al., (2009) livelihood strategies scheme provides a classification of types of livelihood strategies that can be achieved given a combination of different assets and activities. Households respond to changes through livelihood strategies of 'hanging in', 'stepping up', 'stepping out' and Migration (Scoones, 1998) is also included to this classification. **Hanging in** is explained as maintaining the status quo. In this strategy assets are held and activities are engaged in to maintain livelihood levels, often in the face of adverse socio-economic circumstances. **Stepping up** implies increasing levels of existing sets or subsets of activities and/or assets and asset functions. Investment takes place here and there is also accumulation of assets. **Stepping out / Livelihood diversification** involves engaging in new activities with different assets and asset functions. Here people engage in existing activities in order to accumulate assets that will help them pursue other activities which require initial investments and which will lead to higher and/or more stable returns. Scoones (1998) describes livelihood diversification as developing a wide income earning portfolio to cover all types or a particular type of shock or stress. The following classification is based on the assumption that people generally aspire both to maintain their current welfare and to advance it. Also in trying to advance their welfare, people can attempt to expand their existing activities and/or move into new activities (Dorward et al., 2009). This classification is useful in elucidating the importance of current livelihoods, in terms of hanging in and stepping up, as well as considering wider and long-term aspirations of stepping out. It also useful in providing information on how these aspirations may be pursued, and how they affect current livelihood activities.

The household decisions and livelihood strategies contributes to **outcomes**. The outcome of a household decisions could result in a change or lack of change in the access profile of each household which could in turn alter the social relations between groups.

3.3 Analysing the Policy Process

To examine the role that policy plays in addressing vulnerabilities to climate impacts in the study communities the study draws on Keeley and Scoones (1999) policy process analysis framework. Keeley and Scoones (1999) characterise policy process as either linear, causes of action or political technologies. **The linear model** is based on assumptions of rational and

instrumental behaviour on behalf of decision takers (Simon, 1957). The linear process of policy making involves moving through stages of agenda-setting, decision making and finally implementation. This approach has been criticised for being prescriptive and offering top-down solutions to issues. Sutton (1999) contends that as the assumption is made that policy makers approach issues rationally and policies follow a logical stage of process, a policy failure is often attributed to political or managerial incompetence in implementation rather than on the policy itself. **The causes of action approach** on the other hand focuses on policies as courses of action, part of on-going processes of negotiation and bargaining between multiple actors over time (Dobuzinskis, 1992). Policy-making is described in this instance as the science of muddling through (Lindblom, 1959 in Keeley and Scoones 1999). This perspective offers a bottom up view of policy making, focusing on the agency of different actors across multiple interfaces. In this approach, it's important to analyse the day-to-day dealings of practitioners, the timing of trigger events and the role of policy entrepreneurs in pushing policy discussions in new directions (Keeley and Scoones, 1999).

Both the linear approach and the causes of action approach do not adequately discuss issues of power. **The Political technologies** approach however is useful for analysing the power relations underlying the practices of different actors in the policy process. In the Political technologies approach, Foucault focuses on how the relationship between knowledge, power and policy influences the relations of power between citizens, experts and political authorities (Foucault, 1991). In this perspective, expertise plays a major role in framing policy debates. Through the power of expertise, certain assumptions are normalised and subsequently internalised by individuals. Political technologies advance by taking what is essentially a political problem, removing it from the realm of political discourse, and recasting it in the neutral language of science. Policy is therefore represented as objective, neutral and value-free. The political nature of the policy is therefore hidden by using technical, legal or scientific language which emphasises the rationality and objectivity of the policy. Sutton (1999) argues that the masking of the political under the cloak of neutrality creates a distance between policy makers and those affected by policy. It also allows policy makers to be absolved from responsibility for the outcomes of a policy decision.

Keeley and Scoones (1999) build on these approaches. They argue that policy making is not a linear process but a complex one involving the interaction between three elements; narratives, actors / networks, and politics / interests. Their arguments are supported by Tanner and Allouche (2011) who state that the policy making process is not a linear process which is informed by evidence, but rather a complex process, informed by ideology, actors and power relations. Tanner and Allouche analyse policy processes and outcomes in terms of the way that ideas, power and resources are conceptualized, negotiated and implemented by different groups at different scales. They argue that these elements which are required in the formulation of climate change initiatives are present at each stage of the policy making process. Ideas and ideologies are embedded in the conceptualization phase, power in the negotiation phase and resource, institutional capacity and governance in the implementation phase (Tanner and Allouche, 2011: 7).

In the climate change context, the way in which the policy making process is understood often influences the response that is used in addressing climate change challenges. For instance Lockwood (2012) explains that when the adaptation policy process is defined in a rational way as a set of bureaucratic tasks, efforts to address barriers to effective adaptation will mainly be targeted at providing technical assistance in the form of guides for planning. To avoid over simplifying what may generally be a complex issue it is important to examine the mechanisms of decision making and implementation in a place.

Keeley and Scoones propose a framework for analysing the policy making process. This framework involves looking at the intersection between three elements: policy narratives, actors and networks as well as politics and interests. **Policy narratives** are the storylines used in defining a policy problem. They help to identify competing ways of viewing a particular policy problem. Narratives often simplify complex issues and processes to gain validity. Their simplicity makes it easy for communication and they often favour particular interest groups. Some narratives tend to gain more authority than others consequently influencing policy decisions. Even though prevailing narratives can be contested by alternative policy narratives this does not often occur because these narratives are embedded in society and often taken for granted, thus reducing the ability to think about alternatives or different approaches.

The actors and networks are the coalitions and alliances of individuals or institutions with a shared vision. These groups are often so powerful that they can reinforce or change narratives. Actors and networks are made up of a wide range of groups including civil society organisations (CSOs), the private sector and state institutions. These groups are present at local, national and global levels. Although various groups have overlapping and competing agendas the existence of actor - networks is useful for pluralist policy-making involving a range of different stakeholders or actors. Competing interest groups are central to policy-making (Sutton, 1999; Wolmer et al., 2006). Analysing policy networks, helps us to understand why certain types of knowledge persist and where there is space in the policy arena for possible change.

The political context is shaped by the **interests** of different groups in the society. These interest groups exert power and authority and influence the policy making process in diverse ways from the agenda setting to implementation stage. The vested interests of various actors are served by the perpetuation of specific narratives. Even though policies are political in nature the use of technical language often gives a sense that they are rational and objective Wolmer et al.,(2006) emphasise that the technical is always in some way **political**.

Policy space is described as the room for manoeuvre. There are instances when decision making is restricted by the opinions of a dominant actor network or narrative. At other times, too there could be substantial amount of leverage over the process, such that personal preferences of policy makers can be asserted and could inform policy. Policy spaces can be identified by examining the narratives, networks and interests. Such spaces could be found at the local, regional, national or global level, interactions take place at these various levels. Policy spaces provide opportunities to change and influence policy. They are useful to promote alternative approaches to policy, dislodging dominant positions and their associated networks as well as exerting influence over contested policy processes (Keeley and Scoones, 1999; Naess et al., 2015).

Keeley and Scoones' framework for policy process analysis is employed in this thesis to explain how the intersection between narratives, actors-networks as well as politics – interests influences the formulation and implementation of adaptation policies in Ghana. Analysing these intersections is useful for understanding the ways by which climate change adaptation

gets incorporated in political discourses, the process of negotiation between various actors with different interests, and how this influences adaptation options and vulnerability in general. The next chapter details the approach and methodology of the study.

CHAPTER 4

4.0 RESEARCH METHODOLOGY

In this chapter, the study area is described and reasons for its selection are provided. The chapter outlines the methods used in data collection, the activities that took place at the various stages of the field work. It also provides details of the sampling methods used in selecting respondents. The tools that were used in data collection and their relevance for the research are outlined in this chapter. Ethical considerations, the process of data analysis as well as the study limitations are also discussed here.

4.1 Field Site Selection

The study was conducted in Tema and its surrounding communities i.e. Ashaiman and Kpone. These communities are located in the Coastal Savannah of Ghana, a zone that experiences the dry equatorial climate. Rainfall in the zone is bimodal with the major rainy season occurring from April to July and the minor rainy season from September to November. The highest amount of rainfall occurs from May to July. The mean annual rainfall ranges between 730mm to 790mm. Annual average temperatures also range between 25°c to 30°c. The vegetation in this zone is mainly shrubs and grasses. The topography, which forms part of the coastal plains is generally flat and barely rises to 35m above sea level. The almost flat nature of the terrain makes it prone to flooding.

The Coastal Savannah in Ghana has been identified as one of the ecological zones that is highly exposed to climate change impacts. It covers a low-lying area of about 30 m above sea level and is characterised by sandy shorelines and coastal lagoons. This zone experiences extreme weather events like droughts and floods which have an impact on livelihoods, health, food security and infrastructure. The zone is also vulnerable to sea erosion and inundations. Sea level rise will increase the rate of flooding in the zone. The study communities were selected after extensive review of available literature and national policy documents. They were selected because of their location in an ecological zone identified to be highly vulnerable to

climate change impacts and because of their ability to provide information about some of the most vulnerable groups to climate change.

In national vulnerability and adaptation studies, farmers, fishermen and slum dwellers are listed amongst the vulnerable groups that are adversely affected by climate change impacts. These groups have fewer options and less capacity for adaptation because they are generally poor and therefore unable to access assets necessary for them to adapt effectively to climate change impacts (NCCAS, 2012; NCCP, 2013; USAID, 2011). Tema a fishing community and Kpone a farming and fishing community were purposively selected to provide information on the livelihood groups and economic sectors that are most vulnerable to climate change. Ashaiman the informal community on the other hand was selected to provide information about the impact of climate change on the urban poor.

Tema

Tema is the administrative capital of the Tema Metropolis. It is a coastal city in the Greater Accra region of Ghana and is located 25 km east of Accra, the national capital. The Greenwich Meridian longitude 0° passes through Tema. It has been purposively selected for this study because of its proximity to the coast which makes it highly exposed to the effects of extreme-weather events and sea level rise. The area is also prone to sea erosion and tidal flooding. It also provides information on fishers a livelihood group that is vulnerable to climate impacts. The nation's largest seaport, the national oil refinery and a large number of manufacturing industries are situated here. Other economic activities that take place here include fishing, farming and commerce. The city is characterized by high rates of urban population growth with increasing environmental problems. It has a total population of about 402,637 (Ghana Statistical Service, 2014).

Ashaiman

Ashaiman is located about 4km to the north of Tema and about 30km from Accra, the national capital. It covers a total land area of about 45 square kilometres with a population size of 190,721 (Ghana Statistical Service, 2014). It has been purposively selected for this study because it is one of the largest informal communities in the country, a rapidly growing

community that faces a lot of environmental challenges. It is also a migrant receiving community. Historically, Ashaiman provided temporary housing facilities for low income migrant workers employed in Tema however over the years these facilities have become permanent settlements. It is a cosmopolitan community organised along ethnic and religious lines. The major ethnic groups found here include the Ga-Dangme, Ewe, Guans, Hausa, Dagomba, Asante, Fante.

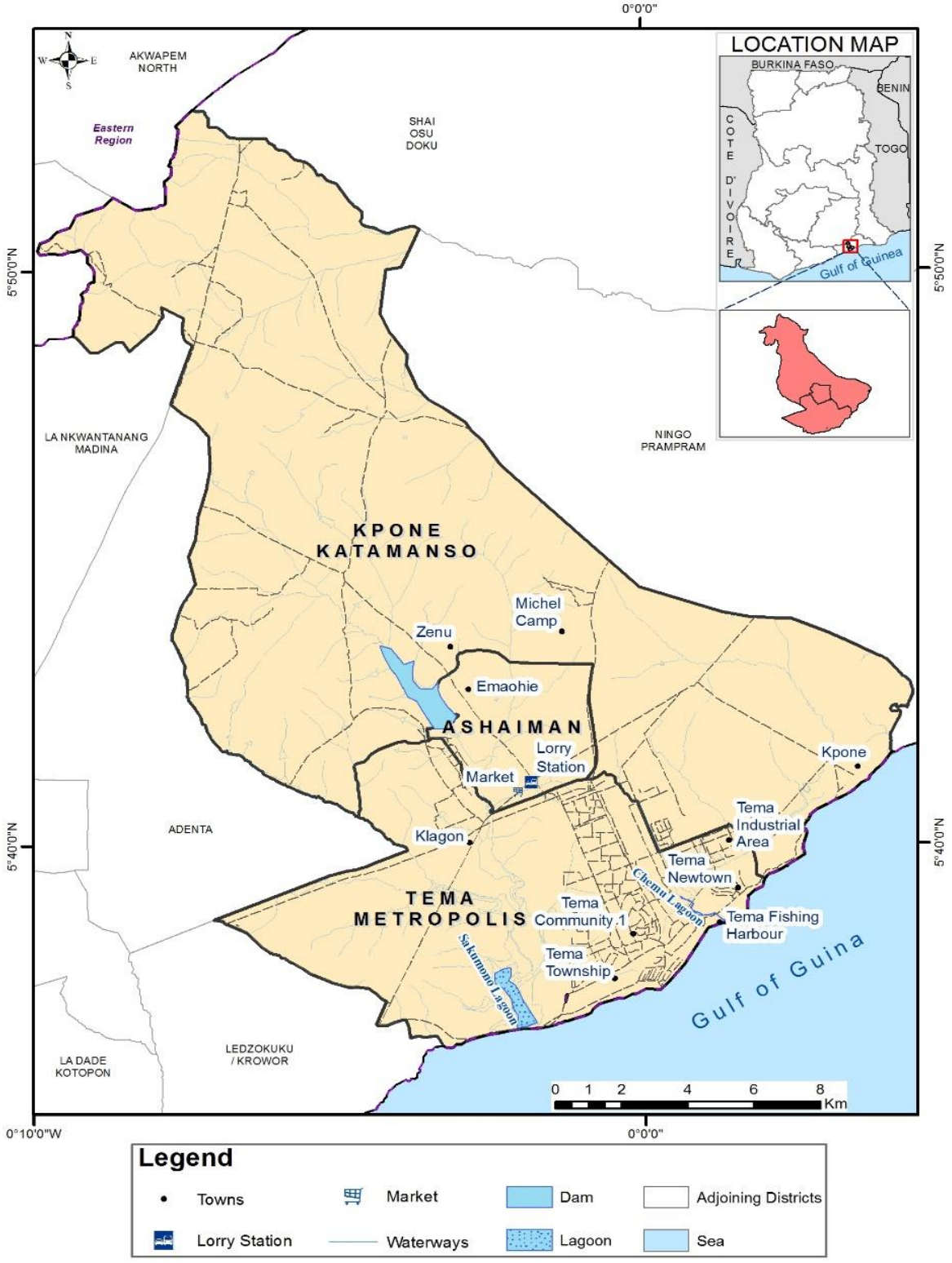
Kpone

Kpone a community in the Kpone-Katamanso District (KKD) is about 4.7 km to the east of Tema and about 33 km from Accra, the capital city of Ghana. Kpone township has a total population of about 11,528 (Ghana Statistical Service, 2014). Major economic activities that take place in this community include farming and fishing. It has been purposively selected for this study because it provides information on farmers a livelihood group that is vulnerable to climate impacts. The community is also plagued with land tenure issues. In recent years a number of industries have sprung up in this locality offering employment opportunities to the local people. The Ga-Dangmes are the dominant ethnic group in this community. The criteria for selecting the communities are presented in Table 4.1

Table 4.1 Criteria for Selecting Communities

	Community		
	Tema	**Kpone**	**Ashaiman**
Physical characteristics			
Dry climate with increasing rainfall variability and hotter temperatures	x	x	x
Prone to sea erosion	x	x	
Prone to flooding	x	x	x
Social Characteristics			
Increased risk of diseases	x	x	x
Issues of land tenure (more pronounced in)		x	x
Increasing environmental problems	x	x	x
High incidence of poverty	x	x	x
One of the largest informal communities in the country			x
Provides livelihood profiles of fishers	x		
Provides livelihood profiles of Farmers		x	
Provides livelihood profiles of informal settlers (urban poor) - variation of livelihood activities			x
Migrant receiving community			x
Has densely populated areas, low-income areas	x	x	x

Figure 4.1 Map of Field Sites



***Source**: CERGIS, University of Ghana*

4.2 Baseline Data

Baseline data for the field study was collected at the beginning of the research through extensive review of existing literature and consultation with relevant key informants. To examine the relationship between climate change impacts and existing vulnerabilities, it is useful to have some baseline data against which changes can be measured. The baseline data collected provided information on the biophysical and socio-economic characteristics of the communities.

The baseline data include:

Table 4.2 Baseline Data

Baseline Data	Data Sources
Climate Data (Climatic conditions, changes in climate variability; Changes in the frequency or magnitude of extreme weather events)	National Climatic Data. Ghana Meteorological Agency. 2010 Population and Housing Census (PHC), District Analytical Report. Ghana Statistical Service (2014). Medium-Term National Development Policy Framework: Ghana Shared Growth and Development Agenda (GSGDA), 2010 - 2013. *National Development Planning Commission (NDPC).* (2010) National Climate Change Adaptation Strategy. *Environmental Protection Agency (EPA). Ghana*. NCCAS (2012) Ghana National Climate Change Policy. *Ministry of Environment, Science, Technology and Innovation. Accra.* NCCP (2013) Food and Agriculture Sector Development Policy II. Ministry of Food and Agriculture. FASDEP (2007) Ghana Climate Change Vulnerability and Adaptation Assessment. United States Agency for International Development. Washington, DC. USAID (2011) Climate Risk and Adaptation Country Profile Ghana. The World Bank Group. Washington, DC. World Bank (2011) The Social Dimensions of Climate Change in Ghana. Development and Climate Change Discussion Papers. Discussion Paper 15. The World Bank. Yaro JA (2010)
Climate change projections	
Topography, Geomorphology of communities	
Housing and shelter, densely populated areas, low-income areas, flood prone areas	
Water source	
Health services; Health risks like malaria / cholera outbreaks	
Sanitation facilities	
Access to food	
Livelihoods	

Crop production and changes in farming methods	Ghana's Initial National Communication on Climate Change to the UNFCCC, (INC) 2000. Ministry of Environment, Science and Technology. Accra.
Fish catch and changes in fishing methods	Ghana's Second National Communication to the UNFCCC. 2011 Ministry of Environment, Science and Technology. Accra. Ministry of Food and Agriculture. Profile of municipalities. MOFA webpage FAO Fishery Country Profile Ghana. Food and Agriculture Organization of the United Nations. Performance Review of Medium Term Development Plan (MTDP) (2006-2009 based on the GPRS II

The baseline data provided useful information for developing question guides. The field data was validated by triangulating it with information gathered from the baseline data. It also facilitated the interpretation of the field data.

4.3 Field Work Activities

The field work was conducted over a seven - month period from October 2014 to May 2015. A thorough review of available literature and national policy documents provided information to select field sites. There were preliminary consultations with the community development department, local leaders, local NGOs and some community members in the selected field sites to identify and establish a viable sampling strategy. Before the selection, a visit was made to the field site in the company of a gate keeper from a local NGO Abibimman Foundation. The consultation and prior visits to the field sites informed the selection of specific vulnerable areas and people within these communities. Participants were purposively selected based on a set of characteristics. The criteria used in the selection process, ensured the selection of participants who were knowledgeable and conversant with the research topic. The characteristics used for the selection included age, gender, place of residence (flood prone areas), occupation, duration of stay in the community and wealth categories (very poor, poor and better-off). The wealth categories were based on identified and agreed indicators by key informants and some community members. The indicators used in assigning wealth categories included asset ownership, type of employment, field size, access to toilet facilities, household size, drinking

water source and educational status. In the Ashaiman community members living in Maamomo, Asensu-Bar and Roman Down were interviewed. Community members living in Tema Newtown, Tema Fishing Harbour and Tema Community One were interviewed in Tema. In Kpone, community members living in the Kpone township were interviewed. A field assistant who was conversant with the communities was recruited and trained to assist in the data collection.

A pilot survey was conducted at the Klagon Ramsar Site a farming community in the Tema Metropolis to test the questionnaire. Ten small scale farmers were selected to participate in the pilot survey. There was also a focus group discussion with seven male farmers. Based on the feedback from the pilot survey the questionnaire and sequence of methods used in the focus group discussions were modified to facilitate the interview process. For instance, as farmers couldn't quantify how much they earn from their farming activities, a question asking farmers how much they earn was changed to "*How many boxes of item x do you sell per harvest? Or How much is each box, bag, sack or basket of item x?"* Again, an observation was made that farmers participated more actively in drawing the community hazard maps than in recalling past events, therefore subsequent group exercises always started with the hazard map. **Table 4.3** below is a summary of the sequence of field activities.

Table 4.3 Fieldwork Activities

FIELD WORK ACTIVITIES **(Oct 2014 – May 2015)**	**OCT**	**NOV**	**DEC**	**FEB**	**MAR**	**APR**	**MAY**
Consultations with key informants at the local level to identify and establish a viable sampling strategy (wealth categories were defined)	**X**	**X**	**X**				
Community entry, visit to selected areas **Recruited and trained a field assistant**			**X**				
Pilot survey to test questionnaire				**X**			
Semi structured interviews with households and key informants in the community					**X**	**X**	
Focus group discussions **Sequence of methods:** **– Community Hazard Maps** **– Historical Timeline** **–Seasonal Calendar** **–Vulnerability Matrix**					**X**	**X**	
Semi structured interviews with institutional actors						**X**	**X**

As the research sought to examine how government interventions on climate change and broader policies or interventions interact with vulnerability and adaptation at the local level, key national policy documents addressing climate change adaptation as well as policies that impinge on vulnerability in the study communities were examined. These policy documents were analysed to find out if they addressed the structural or root causes of vulnerability such as the social relations of power, access to resources and decision-making processes.

The policy documents examined include the:

- Ghana Shared Growth and Development Agenda, 2010-2013 (GSGDA), 2010
- Ghana Shared Growth and Development Agenda, 2014-2017 (GSGDA), 2014
- National Climate Change Adaptation Strategy (NCCAS), 2012
- National Climate Change Policy (NCCP), 2013
- National Climate Change Policy Action Programme for Implementation: 2015–2020
- Food and Agriculture Sector Development Policy II (FASDEP II), 2007
- Medium-Term Agriculture Sector Investment Plan (METASIP), 2010
- National Climate-Smart Agriculture and Food Security Action Plan (2016-2020,) (CSA Action Plan), 2015
- National Urban Policy Framework (NUP), 2012
- National Urban Policy Action Plan, 2012
- National Land Policy, 1999

4.4 Sampling Methods

The household and community were used as the units of analysis in this study. The study follows the Ghana Statistical Services (2012) definition of a household. They define a household as a person or a group of people, who live together in the same house or compound and share the same house-keeping arrangements. Members of a household are not necessarily related by blood or marriage. The study also adopts the definition of a community by MacQueen et al., (2001: 1929). They define a community as a group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in geographical locations or settings.

A total of **48** households were interviewed in the three communities. The household surveys were based on purposive sampling. This sampling method was used to ensure the selection of participants who were knowledgeable and conversant with the research topic. A member of each selected household was interviewed; the individual in this case was an adult who has lived in the community for a long period of time and was conversant with the issues in the community. About **75** respondents particpated in **nine** separate focus group discussions organised for men, women and the youth in each community. Each focus group was made up of about **five – ten** participants. A total of **nine** key informants were purposively selected and interviewed. Key informants included the local leaders and elected representatives in the community. **Table 4.4** below provides a summary of the groups interviewed at the community level.

Purposive sampling was also used to identify the **14** institutional actors who were interviewed. The institutions interviewed comprised of government organisations, Non-Governmental Organisations, International organisations and Research institutions. Table 4.5 provides a summary of the various institutions that were interviewed.

Table 4.4 Summary of groups interviewed at the household and community level

Communities	**Household Interviews**		**Key informants**	**Focus Group Discussions at community level (five – ten participants)**		
	Male	**Female**		**Men**	**Women**	**Youth**
Ashaiman	**7**	**9**	**3**	**1**	**1**	**1**
Kpone	**8**	**7**	**2**	**1**	**1**	**1**
Tema	**7**	**10**	**4**	**1**	**1**	**1**
	22	**26**	**9**	**3**	**3**	**3**

Source: Field study, 2015

Table 4.5 Summary of Institutions interviewed

Government Agencies
Ministry of Environment, Science, Technology and Innovation (MESTI)
Ministry of Fisheries and Aquaculture Development, (MOFAD), Regional Office, Tema
Marine Fisheries Research Department (MFRD), Tema
Ministry of Food and Agriculture (MOFA) - Crop Services
The National Disaster Management Organisation (NADMO)
Environmental Protection Agency (EPA)
Ghana Meteorological Agency (GMet)
Non-Governmental Organizations
ABANTU for Development
Abibimman Foundation
International Organisations
Care International
GIZ
Research Institutions
Institute of Local Governance Studies (ILGS)
University of Ghana - Institute for Environment and Sanitation Studies (IESS)
Financial Institution
Opportunity International Savings and Loans Limited

Source: Field study, 2015

4.5 Ethical Considerations

Before embarking on fieldwork SOAS requires that students complete and submit a Research Ethics Review Form. Issues of ethical concern are raised and addressed in this form. The field work started only after SOAS granted ethical approval. The research involved gathering personal information on identifiable living individuals, such as their experience of climatic changes and how it impacts their lives. To protect the individuals involved, all information collected were anonymized to avoid individual identification. Information collected was kept confidential. Disseminated results will include only anonymized responses. The research also involved youth between the ages of 15 - 18. This group only provided information on their general perceptions of climate change. They were not required to provide answers to sensitive questions. Parents and guardians gave informed consent on their behalf when necessary. Research participants took part voluntarily in interviews, they gave verbal consent before interviews were conducted. They also gave a verbal consent before any audio recording was done. Interactions with key informants before the field work was also very useful in providing

information on how to address community members. For instance, in one of the communities' key informants revealed that politics is a very sensitive subject therefore questions covering political issues should be well phrased so as to avoid any form of agitation from respondents who might be affiliated to particular political groups.

4.6 Data collection Tools

The research drew on both primary and secondary data. Primary data was collected from individual interviews and focus group discussions. Secondary data was gathered from published documents, books and materials produced by other researchers. Statistical information and documents were compiled from various governmental, non-governmental agencies (NGO) and other relevant institutions.

The research also employed various qualitative tools and methods such as semi structured interviews, focus group discussions. The participatory tools used during focus group discussions include community hazard maps, vulnerability matrix, historical timeline and the seasonal calendar. The triangulation of different methods and sources of data increases the credibility of research findings (Patton, 2002).

4.6.1 Semi Structured Interviews and Question Guides

Semi structured interviews are useful in data collection because they give more in - depth information. This method of data collection also allows interaction with the respondent. Unlike the standard questionnaire the questions asked are more flexible (IFRC, 2008).

The semi structured question guides used for household and key informants' interviews in the communities covered questions on the household composition and characteristics, income sources, hazards endangering their livelihoods, their access to resources, institutions they engage with and have access to, household shocks and coping strategies, climate adaptation practices, perceptions about climate change and their knowledge about formal climate change policies or initiatives. The question guides for the focus group discussions covered similar questions above however there was a greater focus on the community and further emphasis was placed on identifying social groups within the community that are most vulnerable to climate change.

The question guide for the institutional actors also covered questions on existing adaptation frameworks, beneficiaries or target groups of policies or programs, the role of various institutions in planning and implementing adaptation programs, incorporation of local knowledge into policies or programs, the integration of climate change into sectorial policies or programs, funding sources for adaptation policies or programs and the implementation of adaptation programmes or initiatives.

4.6.2 Focus Group Discussions

Focus group discussions were conducted in each of the three selected communities. In each community discussion groups were organized separately for men, women and the youth. Men and women of all age groups were selected. The youth who participated were between 15 -18 years. Participants were divided into these groups to get a holistic perspective of the challenges in these communities and to have a fair representation of women, men and youth. Dividing participants into these groups also ensured that people were comfortable expressing their ideas in front of each other (IFRC, 2008). Each group was made up of about five – ten participants. Participants in each focus group discussion were purposively selected. To select suitable participants visits were made to each community prior to discussions this provided an opportunity to interact with community members.

Focus group discussions permitted direct interaction with the participants and this helped to obtain the community's perception about climate change. It also gave further insights into the vulnerability levels of the various communities. Furthermore, the group dynamics facilitated a more in-depth discussion which gave a deeper understanding of the research topic. Participants were guided during discussions to ensure equal participation and to avoid a few people from dominating the discussion.

4.6.3 Participation and Participatory Tools

Participation is understood as a process whereby the researched undertakes their own analysis, reflection and action on an issue. Participation takes place at different levels. Kanji and Greenwood (2001) distinguish between five levels of participation that can take place during a research. These include consultation, cooperation, co-learning, compliance and collective

action. Each of these levels informs us about the extent to which the researched is involved in the research process.

In this research participation took place at the co-learning level. At this level of participation stakeholders and outsiders (the researcher) share knowledge and create new understanding about an issue (Kanji and Greenwood, 2001). The methods and tools used in this research allowed for collaborative inquiry, a learning process that leads to knowledge generation. Participants were also given the opportunity to direct the research process so they could address real contextual needs. For instance, by facilitating the research process participants could map out vulnerable areas in their community. They were also able to identify potential impacts of climate variability and change as well as the constraints and potentials for adaptation. Participants were also informed that information provided could provide an opportunity to influence policy. Participatory tools that were used in this research include the community hazard map, the vulnerability matrix, the historical timeline and the seasonal calendar. They allowed participants to actively engage in the exercise.

The **Community Hazard Map** was selected because of its ability to assist in identifying the areas, resources assets as well as groups that are most vulnerable to hazards. To use this tool participants of the focus group discussion drew a map of their community. They began by identifying a landmark which served as the reference point for drawing the boundaries of the community. After this they identified the areas where settlements and major facilities and resources in the community were located. These included their fishing grounds, agricultural land, water bodies, health centres and schools.

Participants then confirmed that the map was representative of their community. Following this they were asked to identify the areas, resources and assets in the community that are at risk from different types of hazards such as floods, droughts, pests, diseases (human and animal). This was followed by a discussion, participants answered questions about the impacts of the hazards, the coping and adaptation strategies being deployed to address them and the groups that are most affected by these hazards.

The **Vulnerability Matrix** tool was also selected because of its ability to provide details on important livelihoods and livelihood resources that are most vulnerable to hazards. It also

helped to identify coping and adaptation strategies. A matrix was prepared on a piece of paper before the group discussion. During the discussion participants outlined their most important livelihoods resources. This list was then organized based on the different categories of resources i.e. human, social, physical, natural and financial. After this, they identified the four resources that they consider to be most important in achieving well-being and the hazards that affects these resources severely. The resources were listed against the hazard on the matrix. Participants were provided with a scoring system to help them determine the degree of effect each hazard has on the resources that were listed. The scoring system was rated from **zero – three** where **three** was significant impact/ risk on the resource, **two** medium impact/ risk on the resource **one** low impact/ risk on the resource and **zero** no impact or risk on the resource. There was also a discussion after the matrix was drawn. Participants answered questions about the coping and adaptation strategies being deployed, the different strategies that could be adopted and the constraints to adopting these strategies.

The **Historical Timeline** was useful in identifying the trends and changes in climatic variability over time. It also provided an insight into past hazards, changes in their nature, intensity and behaviour. Historical accounts from participants of the changes and trends was validated with climate data. To use this tool a table was prepared and respondents were asked to recall key events in the community these included major hazards and their effects, changes in land use changes in land tenure, changes in food security and nutrition, changes in administration. The information provided was written in a chronological order. Instances when participants could not recall events easily they were prompted with key national historical events to help them fill in the gaps.

The **Seasonal Calendar** was helpful for identifying periods of stress, hazards, hunger and diseases. It was also useful for understanding coping, adaptation and livelihood strategies as well as analysing changes in seasonal activities. A table was prepared showing key events and activities that occur during the year. Participants listed seasons, events and conditions that occur in the community. These included holidays and festivals, planting and harvesting season, periods of food scarcity, times of migration, timing of hazards / disasters such as droughts and floods and seasonal illnesses. Participants then indicated the months when these occur. After

doing this there was a discussion to find out if existing coping / adaptation strategies are working and to also identify strategies that have emerged as a result of the changes.

4.7 Data Analysis

All interviews were audio recorded, translated into English and transcribed by the author. The transcripts were then uploaded into NVivo for analysis. Data was analysed using NVivo software (version 11). NVivo is a Computer Assisted Qualitative Data Analysis Software (CAQDAS) with tools that support the process of analysing qualitative data. It is used to store, organize and manage large amounts of qualitative data.

Initial coding for the research was based on words and phrases that were written down during the fieldwork and during the transcription of recorded interviews. Saldana (2009) describes coding as an iterative process which commences during data collection and not after fieldwork has been completed. After uploading the transcriptions, the coding of data continued and was completed in NVivo. NVivo was very useful in the coding process because it provided tools which helped to interrogate and visualize coded material. The Coding Density Bar for instance provided a visual impression of the relative number of nodes[7] applied to a particular passage. This was useful in identifying the most prevalent theme in a passage. The Word Frequency Query (a tool used for counting words) as well as the Word cloud (a tool used to display frequently occurring words) were useful in estimating the occurrence of a theme or concept in the data.

After coding, matrix coding queries were run to compare the views of different demographic groups on particular issues. The major themes that emerged during coding were also analysed to draw out the interrelationships and patterns in the data. Schutt (2012) describes the examination of relationships as the centrepiece of the analytic process, as this allows the researcher to move from simply describing people and settings to explaining the reasons behind events or occurrences. The analysed field data was triangulated with data from secondary sources to ensure its validity before the final report was written.

[7] In NVivo codes are also referred to as Nodes

4.8 Study Limitations

The principal limitation of this study is its relatively small sample size. Although the data collected in the interviews provides a rich resource for examining the relationship between climate impacts and existing vulnerabilities, it does not necessarily provide the basis for generalisation beyond the communities studied. The aim of the study was not to present a result that was representative of the whole country but rather to provide an in-depth analysis of the relationship between climate impacts and existing vulnerabilities as well as the role that policy plays in addressing vulnerabilities to climate impacts in the study communities. The findings from the study are consistent with existing data and literature that was reviewed.

Another challenge was the difficulty in finding a mutually convenient time for participants that were selected for focus group discussions. Sometimes meetings had to be rescheduled to a time when all selected participants were available. In some instances, selected participants had to be replaced so discussions could proceed. Although participants for focus group discussions were selected to ensure that they were comfortable with each other there were instances where some participants did not make much contributions until they were encouraged to contribute to the conversation. There was also a challenge in using the historical timeline. Although selected participants were adults who had lived in the communities for a long period of time memory lapses made it difficult for them to recall some historical events. They recalled more easily recent events. Participants were therefore prompted with key national historical events to help them fill in the gaps.

This chapter described the study area and justified its selection. The methods used in data collection, the activities that took place at the various stages of the field work were outlined. It also provided details of the sampling methods used in selecting respondents. The tools that were used in the data collection and their relevance for the research are outlined in this chapter. Ethical considerations, the process of data analysis as well as the study limitations are also discussed here. The empirical findings of the study are presented in the subsequent chapters.

CHAPTER 5

5.0 LIVELIHOOD PROFILING AND THE PRODUCTION AND REPRODUCTION OF VULNERABILITY IN THE FIELD SITES

In this chapter, the livelihood profiles of the study communities will be explained. This chapter will give us a general overview of vulnerability in the field sites. The chapter will also examine how existing vulnerabilities have interacted with climate impacts over time to influence vulnerability levels in the study communities.

5.1 Livelihood Profile of the Study Communities

In this section, the seasonal calendar and wealth grouping are used to provide an explanation of the livelihood profile of the study communities. The seasonal calendar is used to identify the main activities that people engage in to obtain income and the hazards that could affect them. It also provides some information about the extent to which households diversify their livelihoods and the variation in the access to food and cash throughout the year. The wealth grouping is used to explain the differences between various groups in the communities. The communities' perception of climate variability and change will also be discussed to understand the changes that have taken place in the communities over time and the hazards that affect the community.

5.1.1 Wealth Group Categories and Characteristics

The wealth categories were based on identified and agreed indicators by key informants and some community members. Key informants were guided to provide indicators to characterise households into different categories. Households were grouped either as very poor, poor and better-off. The indicators used in assigning wealth categories include asset ownership, field size, access to toilet facilities, household size, drinking water source, educational status, and type of employment. Table 5.1 provides a summary of the wealth group categories and characteristics of the study communities.

Table 5.1 Wealth Group Categories and Characteristics of the Study Communities

		Farming Community	Fishing Community	Informal /Slum Community
	Wealth Group Category	**Characteristics**		
Employment	**Very poor**	Unemployed; Casual labourers; Children work to support family income; Food vendors; Petty traders	Fishers; labourers; Unemployed; Children work to support family income	Unemployed; Artisans (tailors, hairdressers, masons) Petty traders; Food vendors; children work as street vendors
	Poor	Casual labourers; Children work to support family income	Fishers; labourers; Unemployed; Children work to support family income	Unemployed; Artisans (tailors, hairdressers, masons) Petty traders; Food vendors; Children work as street vendors
	Better-off	Salaried fixed employment; Able to hire labourers; Formal sector employees	Salaried fixed employment; Able to hire labourers; Formal sector employees	Retailers; Traders, salaried fixed employment
Assets Ownership	**Very poor**	Landless; Tenants Hoes and cutlasses; Live in rented kiosks and dilapidated structures; Squatters in uncompleted buildings; Do not have toilet facilities and pipe borne water at home	Do not own fishing gear; Tenants Live in rented kiosks and dilapidated structures; squatters in uncompleted buildings; Do not have toilet facilities and pipe borne water at home	Tenants; Live in rented kiosks and dilapidated structures; squatters in uncompleted buildings; Do not have toilet facilities and pipe borne water at home
	Poor	Farm size less than a hectare; Hoes, cutlasses Tenant; Do not have toilet facilities and pipe borne water at home	Oven; Grills (made up of wire netting and wooden frames); Tenants; Do not have toilet facilities and pipe borne water at home	Tenants; Live in shared rented houses; Do not have toilet facilities and pipe borne water at home
	Better-off	Owns about 2 hectares or more farmland;	Owns fishing gear: fishing net, outboard motor, canoe	Has toilet facilities and pipe borne water at home;

		Farming Community	Fishing Community	Informal /Slum Community
	Wealth Group Category	**Characteristics**		
		Has pipe borne water and Toilet facilities at home Landlords hoes, cutlasses, water pumping machines, pipe lines, seeds, knapsack sprayers, watering can, fertiliser.	Land lord; Has access to pipe borne water and toilet facilities at home Ovens, cold store; fridge	Landlords **Tailors:** sewing machine; Shops **Hairdressers:** salons, dryer **Food traders:** stalls / kiosks, shops, food stocks **Masons:** trowels, shovels, and head pans
Social Characteristics	**Very poor**	Large family size (eight - ten); children not in school; Excluded from decision making		
	Poor	Large family size (eight - ten); children not in school; sometimes participates in decision making		
	Better-off	Children in school; Influential, participates in decision making		

Source: Field study, 2015

In all the three communities those categorized as very poor or poor are low income earners. They are either unemployed, work as casual labourers on the farms or boats of others. Some are self- employed working in the informal sector as food vendors and petty traders. Their children usually work to support the family income. The better-off households are salaried workers in the formal sector, they are landlords and boat owners who employ labour on their farms or boats. In all the communities, the children of the very poor are likely not to be in school. Children of the poor and very poor often stop attending school after their basic education. The better-off have their children in school and they attend school up to at least the secondary or tertiary level.

The very poor and poor have few assets. In the farming community, Key informants described very poor households as those who do not own lands and the poor as those who cultivate less than a hectare of land. The poor and very poor households do not only work on their farms,

but also work as hired labourers on the farms of the better-off. In the fishing community, the poor were categorised as those who do not own fishing gears but work for others. In the three communities, the very poor live in rented kiosks, they are squatters in uncompleted buildings and live in dilapidated structures. The poor live in shared rented houses. Both the very poor and poor do not have toilet facilities and pipe borne water in their homes. By contrast, those who are considered better-off in the farming community own land, they cultivate about two hectares or more of land. The better-off in the fishing community own boats and fishing gear they also live in their own homes. The better-off in the informal community are landlords they own shops and the tools required for engaging in their livelihood activities. Better-off households in all the three communities have toilet facilities and pipe borne water in their homes.

In the three communities, the poor and very poor have larger households of about eight to ten members compared to six to eight household members in better off households. The better-off households are influential and participate in decision making. The poor are sometimes invited to participate in decision making however the very poor are often excluded from decision making**.**

5.1.2 Seasonal Calendar

The dry season occurs mainly from December – March, this is the most difficult period for households particularly the poor and very poor in the farming community. During this period food is more expensive and the very poor and poor take loans from better-off households or money lenders to make ends meet. During this period farming is combined more intensively with activities such as providing security services, rearing farm animals and petty trading. Some farmers migrate to other regions to farm. From January to early March farmers clear their land in preparation for planting. The main planting season in the farming community is from mid-March to April. Farmers mainly grow the staple maize and vegetables. Vegetables like pepper, tomatoes, onions and okro can be planted all year round. Rainfall in the zone is bimodal, the major rainy season occurs from April to July and the minor rainy season from September to November. The highest amount of rainfall occurs from May to July. There is an increase in the incidence of malaria and cholera during the rainy season. The main harvest starts in August to mid -September, after the sale of harvested farm produce debts are settled.

The lean fishing season occurs between November to May. This season is usually associated with increased prices of fish and high fish imports. There is also increased migration by fishers during this season. During the lean season fishers and fishmongers combine fishing with petty trading and food vending. The bumper or peak season for fishing is from July -September, at this time fishers settle debts.

Slum dwellers are engaged in diverse livelihoods. The study focused on artisans such as tailors, hairdressers and masons as well as petty traders and food vendors. The selected livelihoods fall under the broad category of service providers, manufacturers, agricultural labourers and construction workers. There are seasons where some of these occupations are in high demand and other seasons where they are not. Activities of construction workers like masons for instance can be seasonal. In the wet season, the activities of construction workers like masons are reduced as heavy rainfalls prevents construction work. Some of the activities are also affected by power supply. Decreased water supply affects the supply of electricity in the dry season and this reduces the activities of service providers like hairdressers and those engaged in the manufacturing industry like tailors. Other livelihoods used to support the family income include providing security services and petty trading.

Table 5.2 Seasonal Calendar of the Study Communities

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Weather – All three communities												
Drought	x	x										x
Floods					x	x	x					
Severe rainstorm						x						
Erratic / Irregular rainfall	x	x	x									x
High sunshine / temperature increases	x	x	x									
Reduced rainfall	x	x	x									x
Livelihood Strategies												
KPONE (FARMING COMMUNITY)												
Migration (Farmers)				x	x							
Land Preparation	x	x	x									
Main Planting season (maize, onions, tomatoes, pepper, okro)				x	x	x	x			x	x	x

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Harvesting season									x	x			
Vegetables like pepper, tomatoes, onions and okro planted all year round)													
Other livelihoods used to support the family income include providing security services, rearing farm animals, petty trading (all year round)													
Tema (Fishing Community)													
Bumper or peak season (herrings and salmon)								x	x	x			
Lean season / High fish imports		x	x	x	x	x						x	x
Migration		x	x	x	x	x							
Petty trading (all year round, mostly by the women)		x	x	x	x	x	x	x	x	x	x	x	x
Ashaiman (Informal Community)													
Manufacturing: tailors / seamstresses **Service providers: hairdressers**	**More work**					x	x	x	x	x	x		
	Less work	x	x										
Construction workers: masons	**More work**	x	x	x	x					x	x	x	x
	Less work					x	x	x	x				
Agricultural labourers: traders of foodstuffs. Food vendors	**More work**							x	x				
	Less work	x	x										x
Other livelihoods used to support the family income include providing security services and													

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
petty trading. (all year round)													
Household Food Security – All three Communities													
Food supply (dependent on access to funds, varies with each family, less food in the dry season in all communities and more food in the rainy season.	**More food secure**							**x**	**x**	**x**			
	Less food secure	**x**	**x**										**x**
Cash (varies with each family, less cash in the dry season for very poor and poor farmers and in the lean season for poor and very poor fishers and vice versa)													
Festival (Homowo)									**x**				
Diseases in all three communities													
Cholera							**x**	**x**					
Malaria							**x**	**x**					

Source: Field study, 2015

5.1.3 Climate Variability and Change in the Field Sites

This section will discuss the local perception of climate variability and change in the field sites. The local perceptions will then be triangulated with available meteorological data to ensure its validity.

5.1.3.1 Local Perception of Climate Variability and Change

Households in all the three communities have observed some climatic changes. Respondents reported that they have observed changes in the temperature and rainfall patterns in recent years. They have also experienced changes in the intensity, quantity and frequency of weather

events in the last 10 to 30 years. Erratic rainfall, severe rainstorms, extreme weather events like floods, droughts and temperature increases are some of the climatic changes they have observed in their communities. They noted that previously dry and wet seasons were clearly defined but it is no longer the case today. Community members agree that there is a gradual change in the bimodal pattern of rainfall such that what used to be the onset of the major rainy season (April to July) and minor rainy season (September to November) have changed. These days the rains could either start earlier or later. The dry / harmattan[8] season which occurs mainly between December – March is sometimes prolonged or shortened. The onset of both the rainy and dry season is no longer predictable. The observations reported by the local communities align with official climatic records covering the communities.

During a focus group discussion, a fisherman stated: *"Previously we could tell the rainy season from the dry season but these days it is not the same. Usually from January - March we have very hot temperatures. We cannot predict with much certainty what the weather will be like now but we hope that from April onwards we will begin to have some rains"* (Tema, Fisherman, 03.02.15).

A farmer also stated: *"Previously March was the hottest month and June the month with the highest rainfall. During the month of March, the sun shines very strongly and temperatures are very high but this year for instance we are having heavy rainfall within this period; the rains have started earlier than expected. We have all been saying that the weather has changed. These days the rain falls when it shouldn't be falling and does not fall when it should fall. Nowadays we cannot predict what the weather will be like. We do a lot of guessing to know when to plant or not"* (Kpone, Male Farmer, 24.03.15).

A male respondent from the informal community explained: *"Previously we knew the months in which to expect rain i.e. between June to August and the months in which there would be no rains i.e. December and January but today it is not the same, it is all mixed up. The rain can fall at any time without warning. Now even in the months that we expect rains we can have only one / two major rainfalls and nothing else follows"* (Ashaiman, Male Respondent, 08.03.15). During a focus group discussion with the youth they also reiterated that there have

[8] A dry, dusty north-easterly trade wind that blows from the Sahara Desert in North Africa towards the West African coast between the months of December – March.

been changes in the weather pattern by stating some of the comments their parents have made with regards to the changing climate. A youth commented: *"My parents complain that temperatures have increased, they keep saying they have never experienced this kind of heat and that it didn't use to be like this. These days the sun shines more strongly than it used to"* (Ashaiman, FGD Youth, 15.03.15).

Using the historical timeline during focus group discussions participants recalled some periods they experienced extreme weather events. They mentioned some years in which major floods occurred these included the floods that occurred in July 1995, June 1997, September 2007 and June 2010. They also remembered periods when temperatures were very high and periods of prolonged dry seasons like 1981 - 1983. The dates they provided were consistent with climatic data obtained from the Tema meteorological station from 1965 – 2015. The farmers and fishers were able to identify and remember these dates with such accuracy mainly because they work in a climate sensitive sector. Communities that rely on natural resources for their livelihood are conscious of the landscape and quickly discern climatic anomalies and their effects (Yaro, 2013: 1259). In the informal community respondents noted that there had been several floods however they recalled those that had the greatest impact on them i.e. the June 1997 and the 20th June 2010 flood. Respondents claimed that as flooding is a common occurrence in their community it is the floods that have the greatest impact that they can easily recall. During a focus group discussion with some men in the community they explained: "*Every year we experience some level of floods. It's only the magnitude / severity that varies with each year.*" (Ashaiman, FGD Men, 15.03.15).

Respondents' knowledge about climate change is based highly on their observation of local changes. They are more aware of climate variability i.e the seasonal variations in rainfall and temperature. In all the three communities, observed climatic changes were attributed mainly to environmental degradation. Respondents blamed their own actions, the change in land use patterns including the cutting down of trees for construction, increase of pollution from local industries and the frequent burning of rubbish. Some also attributed these changes to the will of God. A fishmonger stated: *"I think these changes in the weather have occurred because these days we are cutting down trees indiscriminately. Previously trees were protected and*

you could not easily cut down a tree, some trees were even perceived as sacred trees, but today there is nothing like that" (Tema, Fishmonger, 03.02.15).

A farmer stated that as a result of an increasing population, trees have been cut down to construct industrial and residential buildings. *"Temperatures are increasing because we are cutting all the trees to build houses and industries. Previously there were places around here that had a lot of trees it was almost like a forest, no one lived there but today houses and industries are being constructed everywhere"* (Kpone, Female Farmer, 26.03.15). They also attributed the changes they have observed to the pollution from the industries around them. Respondents in the farming community believe that the waste produced from the industries around them is having a negative impact on weather patterns and could be a reason for the low yields they have recorded in recent years. A key informant explained this claim: *"The industries and the waste they produce is also having an effect on the weather patterns and the lives of farmers here. Most of these industries produce hazardous waste, they emit gases which are dangerous and this pollutes the environment. Those farming around the area also complain about reduced crop yield"* (Kpone, Key informant, 31.03.15). In the informal community respondents also believe that an increase in pollution from the frequent burning of rubbish, particularly plastic waste, by local industries is affecting weather patterns. A key informant explained: "*A lot of people here deal directly with metal scraps, they burn tyres and cables in order to retrieve metal scraps from them. There are also those who melt aluminium to make cooking pots and all the smoke coming from these activities is poisonous, it pollutes the environment it is also affecting the weather"* (Ashaiman, Key informant,12.03.15).

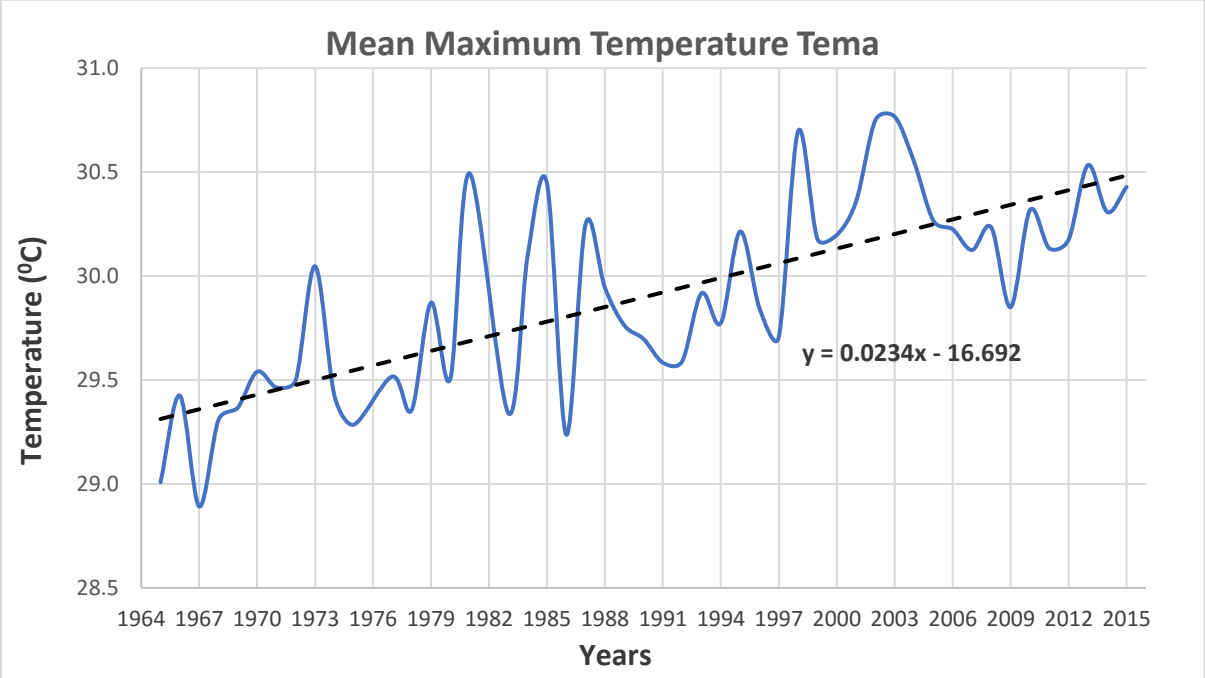
Although the youth in all the three communities noted that they study climate change in school their description of climate variability and change was often related to environmental degradation. These results corroborate findings from studies by Yaro (2013) the BBC world services (2010) and Dumenu et al., (2013) on the perception of local communities in Ghana to climate change. They attribute observed changes largely to local environmental degradation and do not link it to what is happening at the global level. Despite this their knowledge about local environmental change has proven useful for coping and adaptation purposes as will be discussed in the subsequent chapter. A deeper understanding of how global climate change is caused is however lacking. Due to this limitation citizens tend not to put pressure on politicians

to address climate change issues (Cameron, 2011). Most public discussions on climate change often focus on how to stop the actions they consider to be causing climate change (Sarpong and Anyidoho, 2012).

5.1.3.2 Climate Variability and Trends

Data from the Ghana Meteorological Agency (Tema Meteorological Station) covering the period from 1965 – 2015 shows a variation / trend in the temperature and rainfall patterns. The observations of the local communities are consistent with official climatic records. There is a significant level of accuracy between local perceptions and meteorological records of temperature and rainfall data. This could be attributed to the fact that they are engaged in a climate sensitive activity therefore they are likely to be more observant and knowledgeable about their environment.

Figure 5.1 Mean Maximum Temperature Tema

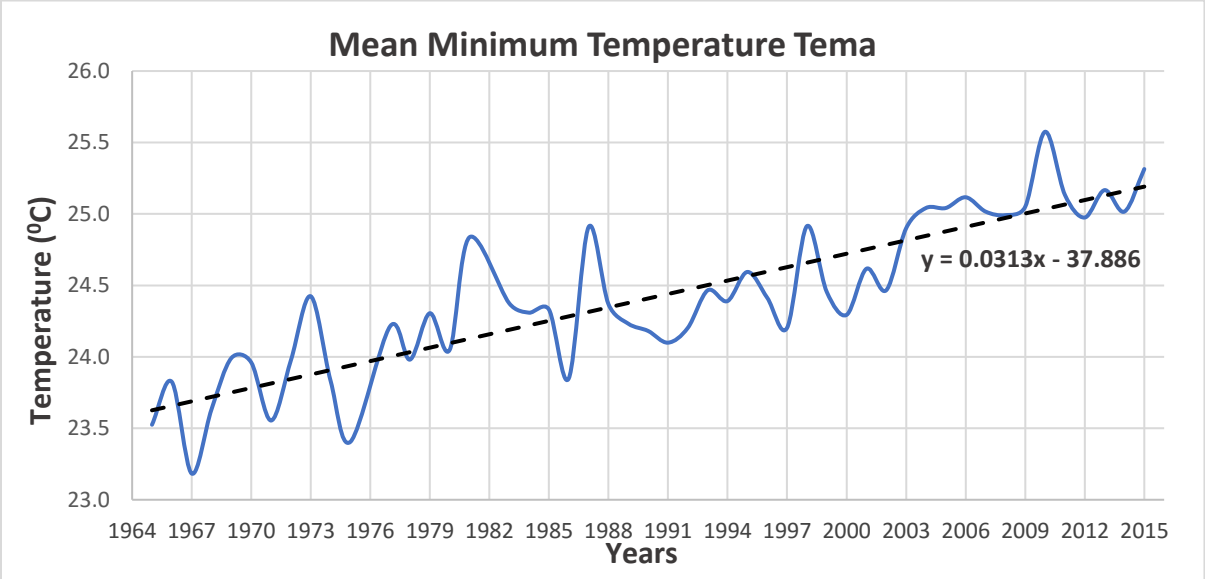


Source: Authors' construct based on data from Ghana Meteorological Agency

Mean maximum temperatures have increased by 0.02 °C between the period of 1965 – 2015. Between 1965 – 2015 mean maximum temperature oscillated between 29°C and 30.5°C. Mean maximum temperature reached a peak of 30.5°C in 1981, 30.4°C in 1985 and 30.2°C in 1987.

There were significant drops in mean maximum temperatures in 1983 and 1986 at 29.3°C and 29.2°C respectively. The highest mean maximum temperature recorded between the period of 1965 – 2015 was 30.8°C in 2003, followed by 30.7 °C in 1998. The lowest maximum temperature was 28.9 °C in 1967.

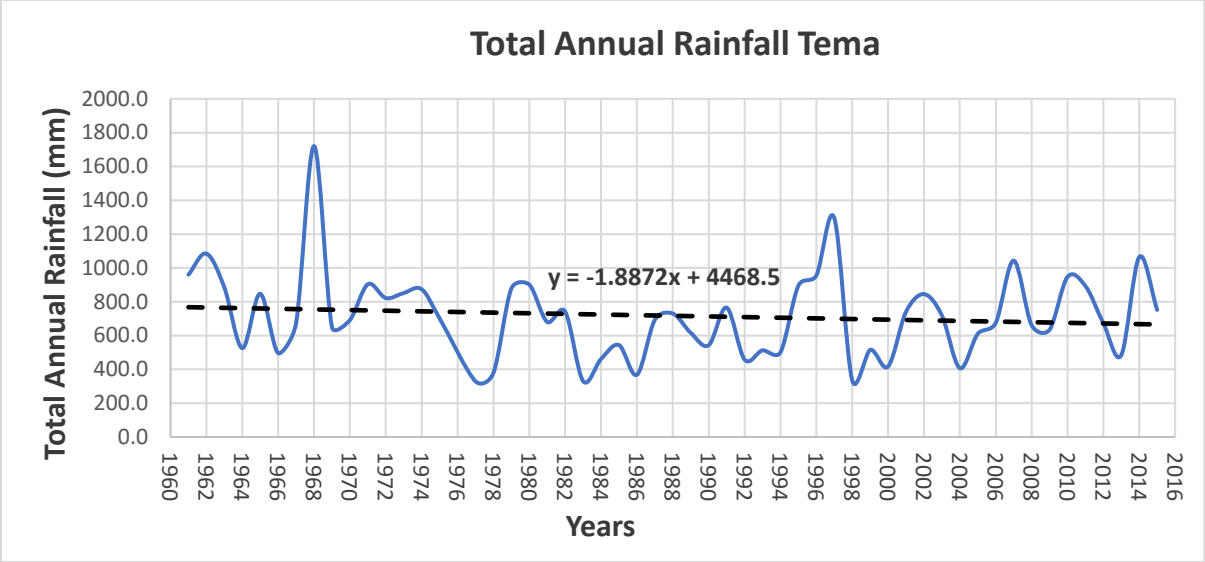
Figure 5.2 Mean Minimum Temperature Tema



Source: Authors' construct based on data from Ghana Meteorological Agency

The mean minimum temperature between the periods of 1965 – 2015 oscillated between 23.8 °C and 25.3°C. The mean minimum temperature has increased at a rate of 0.03°C between the periods of 1965 – 2015. The highest recorded mean minimum temperature was 25.6 °C in 2010 and the lowest was 23.2 °C in 1967. Other years that recorded significant peaks in mean minimum temperature are 24.4 °C in 1973, 24.8°C in 1981 and 24.9°C in 1987 and 1998. Mean minimum temperatures declined in 23.4 °C in 1975, 23.8°C in 1986 and 24.2°C in 1997.

Figure 5.3 Total Annual Rainfall Tema



Source: Authors' construct based on data from Ghana Meteorological Agency

The total annual rainfall in the study area shows that rainfall patterns have been erratic. Annual rainfall patterns have oscillated around 800 mm per year, and monthly averages have not changed significantly. The highest and lowest rainfall ever recorded at this station between the periods of 1961 – 2015 were in the 1960s and 1970s respectively. In 1968 a total annual rainfall of 1720.5mm was recorded and 329.4mm in 1977. Also, in the 1980s there were periods of drought, rainfall was low in 1983 and 1986 with an amount of 330.5 mm and 368.0 mm respectively. In the 1990s rainfall increased from 1995 – 1997 reaching a high value of 1294.8 mm in 1997. It was followed by a significant decrease in 1998 to an amount of about 334.9 mm. High amounts of rainfall were recorded in the 2000s. An amount of 1043.0 mm in 2007, 946.3 mm in 2010 and 1064.6 mm in 2014. Low amounts of rainfall were also recorded within this period, in 2004 an amount of 407.0 mm and 484.6 mm in 2013. In general, there has been a 1.9 mm decline in total annual rainfall from 1961 – 2015.

5.2 Historical Processes and the Contemporary Production and Reproduction of Vulnerability in the Field Sites

This section will examine how existing vulnerabilities have interacted with climate impacts over time to influence vulnerability levels and adaptive capacities in the study communities. To do this some of Ghana's development trajectories will be analysed to see how they have contributed in making households vulnerable and more exposed to climate variability and change. The focus will be on the processes that directly affect the livelihoods of fishers, farmers and urban informal dwellers. These will include processes that have led to the springing up of informal communities, the management of marine fisheries and urban land management.

5.2.1 Neoliberal Structural Adjustment Policy (SAP) in Ghana

Following global and national economic depressions during the late 1970s, in 1983, the government accepted and instituted the SAP. Its implementation comprised of policies such as trade liberalization, retrenching or laying off public sector workers, reduction of government spending through cuts in social services like health education and housing. The liberalisation of local markets for instance exposed local producers particularly farmers and fishers to unequal competition, undermining their livelihoods and increasing inequalities in the society. To implement its liberalisation agenda the government removed import taxes. The removal of import taxes led to a large influx of imported goods into the Ghanaian market. Food imports tend to be relatively cheaper than local food production because farmers in developed countries receive more subsidies than those in developing countries. The government used to provide subsidies on inputs such as fertilizers, certified seeds and tractors for farmers and fishing gears for fishers. However, as part of the reform, input subsidies were phased out and their sale was privatized (Khor, 2006). Although privatisation made inputs more accessible in the market, the subsidy withdrawal and rapid depreciation of the local currency led to a hike in the prices of agricultural inputs and fishing gears. Consequently, inputs became relatively expensive for small scale farmers and artisanal fishers leading to a decline in productivity. For instance, in 1980 the subsidy rate on fertilizer imports was 65% by 1984, the rate had fallen to 45%. It increased again to 59% in 1985 and was phased out in 1990 (Khor, 2006).

The implementation of the SAP led to the deprivation of the rural areas compelling many rural settlers particularly farmers to migrate into urban centres. However, their lack of requisite skills, assets and networks necessary to get into specialised market-based activities in the urban centres caused them to engage in precarious, low paying activities which do not guarantee regular income thereby increasing their vulnerability levels and making them less resilient to adapt to climate variability and change.

The rapid industrialization and expansion in infrastructural facilities policy pursued by the Nkrumah government after independence led to rapid urban population growth. There was an increase in rural – urban migration as a result of the income generation opportunities and social infrastructural facilities that were created through the implementation of this policy in the big cities. This put a lot of pressure on housing provision and urban infrastructure. The population grew so rapidly the government couldn't provide houses to meet the growing demand. This led to the development of slum communities to meet the needs of the urban poor. Following this the implementation of the SAP also led to the liberalization of the housing market. The rent control system which was previously enforced no longer applied. The increasing cost of rent forced households to depart from inner city areas to fringe communities in search of cheaper housing (Yankson and Bertrand, 2012). As a result of this, many low-income earners now live in substandard housing and overcrowded conditions without the resources for decent shelter and access to adequate water and sanitation-related services (Songsore, 2008: 8). Living in substandard housing and in unsafe locations have left these low – income households more exposed to adverse climatic impacts.

The capacity of the state to provide adequate infrastructure to meet the needs of the growing urban population was reduced because of the austerity measures taken by the government during the implementation of the SAP. The introduction of the cash and carry system led to high hospital fees. Many poor households turned to less qualified traditional healers, commercial pharmacies, and unlicensed drug sellers (Boafo-Arthur, 1999). The cuts in government spending for health care and education left schools and hospitals understaffed and led to the resurgence of private schools and hospitals (Konadu-Agyemang, 2000). Subsidies on social services such as water were also withdrawn. The Ghana Water and Sewerage Corporation (GWSC) was allowed to increase tariffs by 25% annually (Whitfield, 2006). The

removal of subsidies on health, education, and social services led to an increase in the cost of these services and a decline in real wages, this worsened the plight of the poor and social groups such as women. Many public service workers were also laid off as a result of the government's entrenchment policy. Over 50,000 jobs were cut in state enterprises between 1987 and 1994 (Konings, 2002).This led to an increase in urban unemployment. Low incomes coupled with adverse climatic impacts further increased vulnerabilities.

5.2.2 The Urbanization Process

Urbanization in Ghana has been driven by demographic processes such as rural-urban migration, population growth and the re-classification of settlements from rural to urban, based on population size (GSGDA, 2010; Songsore, 2009). In Ghana, a settlement with a population of 5000 or more people is considered an urban centre. The rapid increase in urban population coupled with the lack of formal urban planning has resulted in the proliferation of urban sprawls and the development of informal settlements in the country (Adarkwa, 2012; Turelinckx et al., 2014).

Aboagye (2012) notes that the system of planning and building regulation that was pursued in the colonial era resulted in residential segregation and created slum and unplanned settlements. Colonial administrators enforced zoning and building regulations to regulate urban growth. However, after independence government authorities and political elites who took over the European settlements left the native communities to develop without plan. Urban planning under the colonial administration was characterised by a social stratification system of spatial segregation and separation. The colonial elites lived in spacious surroundings in government owned apartments, lower level civil servants in low cost housing estates, and the poor in peripheral squatter settlements. In the post - colonial era, the lack of planning and building regulation and the perpetuation of the social stratification system introduced by colonial administrators has resulted in extreme residential segregation and promoted slum and unplanned settlements (Aboagye, 2012: 161).

Unplanned settlements lack basic social amenities such as water, sanitation, waste disposal and drainage facilities (Amoako and Frimpong Boamah, 2014). Housing facilities in these settlements are poor, settlers live in hazardous and unsafe places such as flood plains,

reclaimed wetlands, banks of major river catchments and lagoons. Settlers in these unsafe places are more exposed to adverse climatic impacts. Also, most of these communities are considered illegal, therefore they are often victims of forced eviction. Large-scale forced evictions by the government are often justified in terms of urban development plans, the beautification of cities and eliminating criminals. Those evicted are often not paid any compensation nor offered alternative homes (Watson, 2009). As a result of these evictions they lose physical assets, and savings obtained from long hours of precarious work, social networks are also broken during eviction exercises (Obeng-Odoom, 2011: 371).

5.2.3 Urban Land Management

There are fundamentally two types of land ownership in Ghana these are public or state lands and private lands. Most private lands are communally owned and are entrusted to traditional authorities such lands are termed as stool/skin lands[9]. Stool/skin lands that have been allocated to various extended families are classified as family land. When skin, stool or family land is sold it is considered private land (Lambrecht and Asare, 2015). Traditional groups, which do not recognize a stool/skin as symbolizing private communal land ownership often vest land ownership in the clan, family or individual. Generally, in Ghana the allodial title to land is vested in a stool, skin, clan, family and in some cases individuals (Ministry of Lands and Forestry, 1999). As custodians of the land traditional authorities can reallocate or sell land.

The increasing demand for land for various urban uses is leading to the commercialization of land. Rapid urbanization has increased the pressure for landowners / custodians of land (Chiefs, family heads / clan heads) to sell peri-urban farmlands for residential buildings and other commercial uses instead of managing it to benefit family members or the entire community. The custodians of the land often sell lands to the highest bidders to the detriment of people who have previously farmed these lands (Yankson et al., 2009).

The process of allocating land for livelihood activities solely through the market often works against the interest and well-being of financially poor indigenes and migrants, and other vulnerable groups who may not be able to access land simply because they cannot afford it

[9] The stool or skin is a symbol of traditional authority in Ghana. In Southern Ghana land entrusted to the traditional authority is called stool land and in Northern Ghana it is called skin land.

(Owusu, 2009). By selling farmlands, the livelihood opportunities of local elites like traditional authorities who are custodians of the land are enabled whilst that of poor local farmers are foreclosed. Owing to the competition for land, farming which used to be the dominant occupation in peri-urban areas is increasingly giving way to other occupations. In many peri-urban areas, the only available lands for farming are along banks of rivers and streams (Yankson, 2000). With loss of farmland and neglect of agriculture, peri-urban households without the necessary skills to move to another occupation are forced to engage in irregular, low paying urban employment like being casual labourers, or engaging in informal trade. The commoditization of land by local elites makes it difficult for farmers to have access to land to meet their basic needs, consequently, widening social inequalities and increasing their vulnerabilities to climate change impacts.

5.2.4 Management of Marine Fish Resources in Ghana

Fisheries management in Ghana has been influenced by the colonial period. The British colonial authorities governed under a 'maximal exploitation' model, advocating for unrestricted, open-access fishing and rejecting the communal marine tenure that existed at the time (Walker, 2002). For instance, they supported the use of the Ali net, a net which can capture both small and big fish because of its small mesh size. This net was widely used and linked to the decline of fish catch at the time. There were fisher groups that opposed the use of this net and particularly its use in their 'claimed waters'. Whenever these groups brought a case to the colonial authorities concerning the use of the Ali net they ignored them. The colonial authorities argued that the sea is a common property therefore boundaries cannot be fixed and that the best fishing net is that which catches the most fish (Penney et al., 2017; Walker, 2002). Their arguments formed a basis to encourage overexploitation of marine fish resources in later years.

Attempts by the government to modernize the fishing sector also influenced fisheries management in Ghana. The introduction of the outboard motor by the Fisheries Department (FD) increased its use and the exploitation of marine fish resources. The FD promoted the use of the outboard motor by providing fishers with credit facilities through the Agricultural Development Bank (ADB) (Overa, 2011). By 1966, 50% of the canoes were equipped with outboard motors. Canoe motorisation increased to 80% in 1972 and canoe fish landings

increased from 33,000–153,700 tons in 1972 to an annual average of 200–250,000 tons in the 1990s (Overa, 2011). With the outboard motors canoes could now travel faster and further out to sea, and could fish in rougher weather. In 1961, The State Fishing Corporation (SFC) was also created. Trawlers were imported and cold storage facilities were also constructed to increase productivity in the fisheries sector. However, because of technical mismanagement, and political instability in the country the SFC collapsed and was sold out in 1988. Since then the fisheries sector industrial trawlers have been operated as joint ventures, with a Ghanaian owner registered in partnership with a foreign capital provider (Overa, 2011).

The industrial fishing sector in Ghana is dominated by foreign Distant Water Fleet companies (DWF) in joint venture arrangements with Ghanaians (Penney et al., 2017). In this arrangement, the Ghanaian law requires that a minimum 51% majority share of the DWF operation must be Ghanaian owned, the license must be registered with a Ghanaian partner. All crew must be at minimum 75% Ghanaian and foreign vessels must pay tax and access fees to the government every quarter (ibid, 2017). Although on paper Ghanaians have a greater share in the partnership, foreigners are often in control of all operations of the vessel as they supply the vessels. In Ghana, DWF activities operate predominantly in bottom-trawling operations within the industrial sector (ibid, 2017). They are often in conflict with canoe fishers because they fish in the zones that have been allocated to them. The artisanal fishermen by law have the exclusive right to fish in the waters at a depth up to 30m, these are often areas of high-productivity however DWFs are now fishing in these areas making the work of canoe fishers difficult. DWFs also under-report fish catch, they engage in the process of transhipment, known locally as Saiko fishing. They exchange frozen slabs of small, often juvenile trash fish caught as bycatch from the trawlers, and give them to the artisanal fishermen in exchange for money (ibid, 2017). The failure of the government to control access to the fisheries resources has been identified as a root cause of the declining profitability of the fisheries sector by the World Bank (Sackey-Mensah, 2012).

Most artisanal fishers are enraged at the activities of these groups as they claim their activities are leading to a decline in fish stocks. Although the illegal activities of DWFs are reported to the authorities they are often ignored. It is alleged that many officials within the government have some stake within these DWF businesses, and are often in receipt of large amounts of

returns from these boats (Penney et al., 2017). As a result of the inactions of authorities to their complaints some artisanal fishers have also resulted to illegal methods of fishing to ensure their own fish supply. Some of the methods include the use of illegal nets and the use of lights in fishing. Overfishing and the increasing competition from foreign vessels increases fishers' vulnerability and makes them less resilient to climatic impacts. During the focus group discussions, some fishers explained*: "Today we have a lot of foreign vessels on our seas and the fishing methods they use are leading to a decline in fish stocks. They often catch juvenile fishes and fish in the zone allocated to us. We hear that some politicians own some of these big fishing trawlers but we are the ones often blamed for the problem of declining fish stocks. The authorities claim it's the light that we use in fishing that has caused a decline in fish stocks. Before the foreign fishing trawlers came to our seas we used to catch a lot more fishes but today it is not the same. The authorities chase us with 'warships' and arrest us. Then they take our fishing gears which they never return. Initially we were not using the light for fishing but we petitioned the government to advice the big trawlers to stop fishing in the zones allocated to us and to stop catching juvenile fishes. The government however did not follow up on it so we had to join in. These are some of the reasons we also don't want to stop using the light in fishing"* (Tema, 10.02.15 FGD Fishermen).

Government efforts to support the activities of fishers has negatively influenced marine fisheries management in Ghana. The government reintroduced a subsidized premix fuel programme to help artisanal fishers increase their catch and consequently increase their incomes and standard of living (Sackey-Mensah, 2012). At the national level, the management of the premix fuel is done by the National Premix Committee and by the Landing Beach Committees (LBCs) at the community level. For administrative purposes, community development programmes as well as the welfare of the fishermen, the LBCs are permitted to put slight margins on the sale price. Subsidised premix fuel has sometimes been diverted onto the black market, leaving fishers, particularly the marginalised unable to access premix when necessary (Tanner et al., 2014). Although the subsidy helps fishers to cope with lower income from declining catches, it also encourages fishing with diminishing stocks and is therefore unsustainable. The premix fuel subsidy and tax waivers cost the Government of Ghana USD 44 million annually (Tobey et al., 2016). The subsidy programme has also led to an increase in the number of canoes in recent years (CRC, 2010). Sackey-Mensah (2012) argues that

maintaining fishing efforts by giving subsidies supports unsustainable usage of fisheries resources which leads to the depletion of fish stocks. It also results in low catch per unit effort which reduces the income per vessel. Overexploitation of fish stocks, lowers fishing productivity in the long run, and increases the vulnerability of fishers.

This chapter discussed the livelihood profiles of the study communities and provided a general overview of vulnerability in the field sites. It also examined how existing vulnerabilities have interacted with climate impacts over time to influence vulnerability levels in the study communities. The next chapter will examine how social relations of power brings about differential vulnerability to climate impacts in the field sites

CHAPTER 6

6.0 SOCIAL RELATIONS OF POWER AND DIFFERENTIAL VULNERABILITY TO CLIMATE IMPACTS IN THE FIELD SITES

The preceding chapter discussed how historical processes created vulnerabilities which have interacted with climate impacts over time to influence vulnerability levels and adaptive capacities in the study communities. This chapter will analyse how social relations of power influences, access profiles, and how this in turn influences livelihood options, income opportunities household choices and decisions as well as livelihood strategies of the various social groups in the field sites. The relation between diverse social groups including men, women, youth, landlords, tenants, state officials and commercial lenders in the field sites will be analysed. The chapter will discuss how these relations bring about entrenched inequalities and dependencies in the face of climatic changes. The chapter will also discuss how access influences the capacity of households to adapt to / cope with shocks and stress.

6.1 Social Relations of Power, Access Profile and Differential Vulnerability to Climate Impacts.

6.1.1 Access to Financial Capital

Poor and very poor households in the study communities face a challenge in accessing finance. They are dependent on commercial and local money lenders who charge high interest rates, demand documents and collateral before providing credit. They also use coercion and other shaming practises to ensure loan repayment. Respondents noted that they are often unable to present the documents and collateral required by some of these organisations to access credit. In addition to this, these organisations have high lending rates. A large proportion of households in the study communities work in the informal sector, they often require money to expand their enterprises. Most farmers and fishers rely on credit at the beginning of the farming or fishing season to purchase their farming and fishing inputs. Financial institutions like the microfinance institutions often avoid lending to small-scale farmers and fishers because of the

volatile nature of their work. For instance, unpredictable weather patterns adversely affect crop growth, fish catch can also not be guaranteed. In addition, farmers lack what financial institutions will consider suitable as collateral like land deed and farm machinery. The sources of finance for fishers and farmers have often not been targeted to meet their needs. Financial institutions often do not take into account the sensitivity of the livelihoods of fishers and farmers to climate variability and change when providing them with credit. Their inability to access credit affects their productivity negatively.

Commercial money lenders like Microfinance institutions charge high interest rates and give short periods for loan repayment. It is usually impossible for local enterprises to have a high turnover to repay at the time they are given. The effect is that debts are often never fully paid back but repeatedly rolled over to become an ongoing power relationship between the debtor and the creditor (Taylor, 2013: 323). In the absence of a collateral, MFIs use strategies such as group lending to ensure loan repayment. With group lending, loans are given to small groups of about five - ten people. Group members use their judgement to select members of their group, members of the group are selected based on trust and reliability. This method of lending often facilitates repayment because members of the group know each other and as they would want to avoid scrutiny and shame would make every effort to pay. In instances where a member is unable to pay a weekly instalment, microfinance workers encourage group members to use coercion to ensure that repayments are made. Coercion and shaming practices cause debtors to lose their social dignity which is a prerequisite for household wellbeing (Taylor, 2012). Where over time a group member is unable to pay their debts other group members become liable for the debt. Microfinance workers force group members to contribute to pay off the debt of the delinquent group member. This further imposes a financial burden on them. The joint - liability often serves as a deterrent for individuals trying to access loans from micro-finance institutions. A male respondent stated: *"Previously as a group we could go for loans to help with our jobs but some people default on payments, and this becomes a burden to the whole group as we have to put pressure on defaulters to pay up, it creates a lot of tension so these days we do not do that anymore"* (Ashaiman, Male Respondent, 08.03.15).

An official from a microfinance organisation explained that Microfinance Institutions (MFIs) prefer group lending because it helps them to diversify risk by bringing together individuals

engaged in different business ventures. It's also a measure to reduce the rate of defaulters. As buildings and streets in these communities do not have addresses it is often difficult to trace debtors but when they are within a group it makes identification easier and facilitates the repayment of loans. The officer also explained that interest rates of MFIs in Ghana are high because of their high cost of operation. Interest rates for the main stream banks is about 28-30% per annum but for micro finance organisations it ranges between 36% and 48% per annum. Even though the interest rates are high for MFIs the procedure to secure a loan with them is relatively easier as compared to the conventional banks that ask for collaterals or physical assets.

Majority of the households in the study communities depend on informal financial sectors such as self-help groups and money lenders to finance their activities. Financing of agricultural activities in Ghana is largely dependent on informal financial sectors comprising mainly of middlemen or market traders, self-help groups and money lenders. Transactions in these instances is based largely on relationships and does not require any form of legal documentation (Quartey et al., 2012). Most farmers and fishers borrow money from market traders. The farmers use this money to grow their crops and after harvest repay these loans by selling their crops to them. Fishers also use the money to buy fishing gears and inputs and repay after their fish catch. This kind of credit often gives the lender an advantage over the debtor as the farmer or fisher bears a greater risk. For instance, if there is a crop failure due to climate variability or there is low fish catch, the farmers or fishers are still obliged to pay the debt. Even though the lender has nothing to purchase, yet the borrower remains saddled with the debt (Taylor, 2013: 323). Also, if input prices go up increasing their cost of production the borrowers still have to sell their crop or fish catch to the lender at a rate far below the market value consequently reducing the profits they could make. A farmer explained: *"The market women we borrow money from usually like to dictate the price at which we should sell our farm produce. We do not make much profit when we sell to them. We are often forced to reduce the prices for them whether we have a good or bad harvest" (Kpone, Male Farmer, 24.03.15).*

6.1.2 Human Capital

Amongst the respondents in the three communities' majority of the better off households had at least up to secondary education. By comparison, the poor and very poor had basic education,

a few others had also never been to school. Most parents in this wealth category cannot afford to send their children to school. Even though basic education is free, they cannot afford to pay for the cost associated with sending their children to school like buying school uniforms and transportation. Girls from very poor and poor households are less likely to attend school as compared to girls from the better-off households. As a result of low levels of education and skills amongst the poor and very poor households they are often unable to engage in wage earning activities which provides a more regular source of income. They work as casual labourers on construction sites and farms, as labourers for boat owners or as street vendors. These jobs are irregular, low paying and often in unsafe environments. In better-off households where members have obtained some formal education they are able to engage in wage earning activities and tend to have more stable and higher level of incomes. Wage earning activities helps to reduce a household's vulnerability to climate impacts. Although educational facilities are available in all the three communities the availability of funds determines whether children attend school or not.

The high incidence of malaria and diarrhoea in these communities affects the ability of households' to work. The high prevalence of these diseases could be attributed to the poor sanitary conditions in these communities, the limited access to domestic toilet facilities, and the few designated places to dump refuse. In all the three communities, malaria and diarrhoea are the most prevalent diseases that affects the households ability to work. The review of the Medium Term Development Plan (MTDP) for Tema (TMA, 2010) revealed that malaria continues to top the chart of the most frequently reported diseases in the Metropolis. In all the study communities there is limited access to domestic toilet facilities. Households use public toilets which are not well maintained and which often become a source of infection. As a result of this people prefer to use the beaches or bushes. A female respondent indicated*: "We do not have a toilet at home. We use the public toilet. It is not very clean but we have to manage it. Using these public toilets often increases our risk of getting infections"* (Ashaiman, Female Respondent, 15.03.15). Kpone, a township with a population of about 11,528 is reported to have six public toilet facilities (Ghana Statistical Service, 2014). These facilities are not enough to serve a fast-growing community. Most of the poor and very poor households do not have toilet facilities in their homes. They use the public toilet, which they pay for. Paying to use this facility can sometimes be a challenge for households with large family sizes. Homeowners /

the better off households who can afford to construct toilet facilities in their homes provide these services to neighbours for additional income. Households that have limited access to basic public services have higher vulnerability levels as they spend a lot of their income paying for these services provided by private individuals. Also women's role as carer's when family members are unwell reduces their ability to engage in profitable activities.

There a few designated places provided by the authorities / Assembly to dump refuse, in addition to that the trucks that have to pick up the rubbish from these sites are irregular. Community members tend to dispose waste in open spaces, along the beaches and lagoon. A male respondent explained: *"Sanitation here is bad. People throw rubbish anywhere they want to. There are no designated dumps for throwing refuse. The trucks that come to pick the rubbish do not come regularly"* (Ashaiman Male Respondent, 09.03.15). The practice of disposing rubbish hapharzardly increases the risk of floods after a heavy rainfall and consequently the increase in the outbreak of diseases like malaria and cholera. Occasionally community members clear these rubbish sites by burning. Some private trucks have also taken advantage of the situation to provide these services to community members at a cost. Most households do not use these services as they claim they are expensive and irregular. Private trucks charge according to the size of the rubbish container of a household, their prices range between GHS[10] 0.50 - 5.00 per collection. Better-off households who live further away from dumping sites tend to use this facility more often than the poor and very poor households that live close to these sites.

Labour is one of the most important assets for households in the three communities. They exchange labour directly for cash or indirectly, through the production of goods and services (Moser, 1998: 24). It is therefore essential that people stay healthy so they can work. The respondents claim they do not have adequate health facilities in their community. There are few public health facilities in the study communities, these facilities are also not well equipped thereby affecting their capacity to deliver quality healthcare. A greater percentage of available health facilities are privately owned and relatively more expensive. The 2014 Ghana Statistical Service report states that Ashaiman has 17 health facilities with only one public health facility. Major cases are referred to the Tema General Hospital (Ghana Statistical Service, 2014). Also

[10] USD 1.00 = GHS 3.80 as of March 2015

in the Kpone township the community members claim the health centre in their community has only a few doctors and is not well equipped therefore, most of them go out of their community to seek medical care. A key informant said: *"We have a health centre here but it is inadequately equipped the authorities are having discussions to upgrade it to the status of a Polyclinic. Most of us go to the hospital at Tema"* **(**Kpone, Key Informant, 31.03.15). The GSS (2014) report confirms that the public health facilities in the district have no resident doctors however they offer outpatient, antenatal and prenatal care services. Also because of their closeness to Tema most referral cases are sent to the General Hospital in Tema.

Respondents access health facility using the National Health Insurance card or by paying cash. Once enrolled households can access public health facilities using the National Health Insurance Scheme (NHIS) ID card. However, they emphasized that patients with money are always treated before those with the insurance card. They also mentioned that card holders cannot get treatment for certain types of diseases and are sometimes given inferior drugs. As a result of the inefficiency of the health insurance system better-off households prefer to pay to use the private health facilities.

In the farming community, Better-off households hire labour to work on their farms however the poor and very poor farmers who cannot afford to do this farm smaller plots. As it is difficult to find farm labour in the farming community, better-off households mostly bring in labour from the Northern part of the country. The farmers consider labour as one of the most expensive farm inputs. Farmers explained during a focus group discussion: "*We spend a lot of money hiring farm labour; the cost of labour is very high we spend about GHS 200.00 per week on one labourer. We pay them wages, feed them and take care of their rent. We spend almost GHS 1000.00 per month on labour. Usually we bring labourers from the North, even when crops fail we still have to pay the labourers in order to avoid any conflict"* (Kpone, FGD Male Farmers, 07.04.15). Most of the female farmers who cannot afford to hire labour tend to farm smaller plots of land. A female farmer stated: *"I do not have enough money to hire labourers to help me plant and take care of the crops. If I did I would have hired some people to assist me and would also have farmed a bigger plot of land"* (Kpone, Female Farmer, 26.03.15).

Although the poor and very poor households have large family sizes with a youthful composition most of them do not depend on family labour. This is mainly because most of the youth or household members who can assist with farm activities are not interested in farming activities and would rather engage in other wage-earning activities. As in many other developing countries, the youth in Ghana are gradually turning away from farming (Bryceson, 1996, 1997). During a focus group discussion, a youth stated: "*We are not interested in farming because it is considered a low-income job, farming is seen as a job for the uneducated. Farmers are always working hard but never have enough money to show for it"* (Kpone FGD Youth, 31.03.15). White (2012) expounds on reasons why the youth are uninterested in farming. He states that existing educational systems particularly secondary education 'deskills' the youth by not including in the educational curricula courses that will help them acquire practical farming skills. Farming is often presented as a downgraded occupation, a last resort for those with no education and who have no other options of employment. In addition to these the youth face a greater challenge in getting access to farm land as rent seeking local leaders and national elites sell off productive lands leaving the youth with nothing. Climate impacts, the difficulties in obtaining land for farming and the high cost of farm inputs have made what was previously a relatively reliable way of making a living become less so. Although most of the youth would rather engage in white collar jobs these jobs are often not readily available. Some of these jobs also require skills that they do not have. This has left a large number of the youth either unemployed or under-employed working in low-skilled or low-wage jobs.

6.1.3 Access to Natural Capital

Access to land is particularly important in explaining vulnerability in the farming community. The commoditization of land has reduced farmers access to farmlands. Traditionally land is owned by chiefs, clans and families through inheritance from ancestors, however in recent times due to rapid urbanization and an increased demand for land for residential construction, land rights are increasingly individualized and privatized as opposed to group or communal rights (usufruct). The elite capture and oppression by chiefs, clan heads and family heads has made land less accessible to the locals. Due to the limited access to land in the community some poor and very poor farmers farm on restricted areas along power transmission grids which they call 'high tension areas'. A farmer described the situation: *"Things have changed*

here quite a lot. Previously we had almost all the land to ourselves for farming, there were no houses here but in the last few years' residential buildings have been put up here this has reduced the land available to us for farming. We are now forced to farm under the high-tension areas i.e. power transmission grids" (Kpone, Male Farmer, 23.03.15). Plots of land along power transmission grids belong to the government. Individuals are not permitted to construct buildings on such lands. The farmers do not pay rent to use the land but they are restricted to the type of crops they can grow on such lands. They usually grow crops that can be harvested within a year (annual crops) and crops which do not grow to very tall heights. The unequal power relations between men and women creates the opportunity for men to have access to more fertile land than the women. Female farmers in the farming community tend to farm on infertile land along the beach. A female farmer complained: *"Previously the local authorities did not use to sell the lands most of the lands were leased to individuals but these days they are selling all the lands and we do not have enough land to farm again. We now have to farm along the beach where the land is not very fertile"* (Kpone, Female Farmer, 26.03.15). The type of land to which households have access is very important. Lack of access to quality land makes them even more vulnerable to climate variability.

Picture 6.1 Farming along power transmission lines

Source: Field study, 2015

The better-off households also have on average twice as much land as the poor. Most farmers have small farm plots scattered in different locations. They stated that industries and estate

developers are encroaching on their farm lands. During a focus group discussion, female farmers stated: *"We are losing our lands to estate developers – sometimes they come with caterpillars to clear the land on which we have grown our crops so that they can start with their construction work. They usually do not give us any form of notice before they do this"* (Kpone, FGD Female Farmers, 08.04.15). The farmers mentioned that they sometimes seek permission from new landlords to grow their crops. Some of these landlords allow them to use the land only on the condition that they will be caretakers. In this instance, they do not pay rents but can farm only as long as the landlord is away. The farmers' dependence on landlords for productive assets like land puts them in a precarious position as landlords can decide to come for their lands at any time. The insecure land tenure affects the kind of crops they grow. A female farmer indicated: "*Currently we are farming on land that belongs to others, we can be asked to leave at any time. This makes our work very unstable*" (Kpone, Female Farmer, 26.03.15).

Prior to the sale of these lands to private buyers' communal / family land was readily available for individuals who needed to use it for farming, they only had to inform the traditional authorities or family heads about their intention to use a plot of land and could farm on it as long as they wanted. In the farming community respondents noted that traditional authorities were responsible for selling traditional lands. The traditional authorities in this community are selling land mainly for residential settlements and for the construction of industries. They give the locals the assurance that these developments would provide employment opportunities for community members. However, interviews with community members revealed that they are not benefitting from the land sales. Liberalising reforms which aimed to create land markets, had the destabilising effect of denying people who previously had access to land the means to continue with their livelihood activities. The ways in which land reforms have been delivered through traditional authority mechanisms, has changed traditional authorities such that, they are no longer interested in the equitable distribution and access to land but rather on making financial gains from land sales. Vulnerability has therefore been increased, not decreased as a result of these land reforms. The implementation of the National land policy will be discussed further in chapter seven.

Majority of the farmers depend on rainfall to grow their crops. Streams flowing in the farming community (Kpone) are seasonal in nature. The unequal power relations that exist between men and women is also seen in the location of farms. Most of the male farmers are situated near waterways and streams, which allows them to practise irrigation farming. However, during prolonged dry seasons or periods of drought water supply for farming is limited as streams dry up, making farming very difficult. Unlike the male farmers who can have about three production cycles in a year because of their location to streams and their use of irrigation facilities, female farmers farm only when they expect the rains. Most of the female farmers here do not farm close to water sources so during the dry season it is difficult for them to grow crops. Access to productive resources like land are often mediated by men (chiefs, family heads, husbands, fathers and brothers). As a result of the traditional patriarchal system, male farmers are often allocated larger plots of land and productive land near water resources. Traditionally, the responsibilities of men in the household are considered to be greater than women. Men are considered to be the main providers of the family, consequently they are given preferential access to land resources so that they can have the necessary material resources to meet the needs of the family.

All the three communities have pipe borne water however not all homes in these communities are connected to the main pipelines. Better off households who can afford to connect pipe borne water in their homes provide these services to neighbours for additional income. Households without water have to buy water. There are however times when the taps do not run at all in the communities, households therefore store water against such periods. A respondent stated: *"There are periods when we have no water because the taps are closed during this time people have to find their own source of water. Some people store water in reservoirs or storage tanks. For instance, I store water in a reservoir and can use it for about a week or two during long periods when the tap is closed"* (Ashaiman, Key informant, 12.03.15). Although there is pipe borne water in all the three communities there are places in these communities that do not have access to drinking water. For instance, in Kpone i.e. the farming community owing to the low pressure of the pipe borne water system there are parts of the community that does not have access to drinking water. As the population in the study community has increased there is more pressure on the water source and authorities have not made water accessible to households living on a slightly higher slope. Most of those living in

such places buy water from the water tankers which they claim is quite expensive. A female farmer mentioned: *"The taps flow here but it does not flow regularly. In about three months we have the taps flowing just once. There is water flowing on the other side of town but the water does not get to us. .... We buy water, a water tanker goes for between GHS 170 – 200"* (Kpone, Female Farmer, 26.03.15). Better -off households depend on private water tanker services for their water supply particularly during the dry season however the poor and very poor households go in search for water over long distances or have to buy buckets of water.

Artisanal fishers also suffer from unequal power relations. Although local norms prohibit fishing on Tuesdays and places a ban on fishing activities before and during the annual festival in this community. These restrictions are not strictly enforced as before and some fishers particularly the industrial vessels do not readily adhere to these traditional practices. Marine fishing in Ghana is an open access fishery. Open access, weak governance and an increase in active semi-industrial vessels, industrial trawlers and canoes have led to overfishing. Open access fishing has been identified as one of the major factors contributing to overfishing in Ghana (Abane et al., 2013; CRC, 2013b; Tanner et al., 2014). Foreign DWFs have created competition for local fishers. They are often in conflict with canoe fishers because they fish in zones allocated to them and use illegal methods such as pair and bottom trawling in fishing. When they fish in these zones they catch the fishes that artisanal fishers would usually catch and this reduces their total fish catch and income. As owners of industrial vessels have close relationship with officials within the government, usually little or no action is taken against their illegal fishing practices. In comparison, artisanal fishers who practice illegal fishing are constantly being arrested and their fishing gears seized. Most of the fishers interviewed were of the view that the enforcement unit is more interested in arresting and sanctioning artisanal fishers involved in light fishing than industrial vessels. The unfair competition from DWFs has adverse effects on fish catch and the total earnings of fishers. Low incomes from fish catch reduces the capacity of fishers to adapt effectively to climatic impacts.

The high cost of rent in Tema and Ashaiman has compelled low-income households to live in dangerous locations, densely populated areas and in unsafe buildings. It has also led to the construction of unauthorized building on waterways consequently increasing the risk to flooding. Housing for urban poor households can be compared to land for rural folks. It is one

of their productive assets providing both shelter and a place for conducting business activities. Households sometimes rent out their space to provide some income, others also conduct their business enterprises from their homes (Moser, 1998; Tacoli, 1999). Majority of the respondents in the study communities live in rented houses. Most of them also conduct their businesses in rented shops or stalls. Respondents stated that in the last few years' landlords have been increasing rents, consequently they spend a large proportion of their income on housing costs. The regulations on rent are often not enforced by the authorities therefore landlords can exploit tenants and take exorbitant prices. The high cost of rents reduces a household's total earnings and disposable income thereby increasing their vulnerability levels.

6.1.4 Access to Physical Assets

Most of the households depend on other social actors for the productive assets necessary for the pursuit of their livelihoods this reinforces relations of power and dependency between social groups (Taylor, 2015). Poor fishers for instance depend on boat owners for their jobs. Their relationship with boat owners is often uncertain as they work on contract basis for boat owners and could be laid off at any time. Boat owners provide money to buy fuel for fishing and are also responsible for the maintenance of their boats. As payment for the work they do fishers are given a portion of the fish they catch. However, when fish catch is low some boat owners renege on earlier commitments and pay them less. Some boat owners also pay less based on suspicion that fishers may have sold a portion of the fish catch illegally to make some profits.

Also, the relationship between farmers, fishers and input suppliers (fertilizer suppliers, seed suppliers, premix fuel distributors, tractor service providers) is one of dependency. They are dependent on suppliers for the inputs required to earn a livelihood. Artificial shortages created by input suppliers can have negative effects on their production. Also, high import costs have adverse impacts on the prices of inputs this increases their cost of production. Most farmers do not own tractors therefore they depend on tractor service providers to clear their land. These service providers sometimes take advantage of the farmers and charge exorbitant prices especially during the period for land preparation. Most of the farmers claim it is very expensive to hire tractors and they sometimes have to book way in advance as tractors are limited. The current tractor to farmer ratio in Ghana is 1:1,500 (MOFA, 2013). A male farmer stated: "*I*

hire a tractor to clear my land, it is difficult to come by tractors these days and also expensive. We have to book them early, long before the rains begin. When I hire a tractor to clear the land they take about GHS 60.00 per hectare" (Kpone, Male Farmer, 24.03.15). The unequal social power relations between men and women is also seen when female farmers have to wait until male farmers have finished ploughing their lands before they are given access to tractors to clear their own land even when they put in a request first.

Premix fuel which is a mix of oil and petrol is a subsidised fuel that is used to power the outboard engine of the boats of small scale fishers. Distributors sometimes divert subsidised premix fuel from the main target group onto the black market leaving fishers, particularly the marginalised unable to access premix fuel when necessary. These artificial shortages lead to an increase in prices and their cost of production. The distribution of premix fuel is often subject to party political biases which favour some fishermen over others (Tanner et al., 2014: 18). As stipulated by law representatives of fishers are required to oversee the distribution of premix fuel however this is often not the case. Politicians have incentives to control the distribution of premix fuel because they benefit in terms of votes and maintaining client networks. Party officials tend to usurp this role and use it as an opportunity for rent seeking (Tanner et al 2014). The distribution is therefore used as an opportunity to reward and punish political supporters and opponents. This often leads to inequitable and inefficient distribution. Supporters are rewarded by ensuring they have regular supply of pre-mix fuel whilst opponents would have to buy the fuel at a higher cost because of the artificial shortages that are created.

Another relationship of dependency is seen amongst farmers and market traders as well as fishmongers and fish traders. Almost all the farmers interviewed claim they do not have storage facilities so they are forced to sell their farm produce as soon as they are harvested. They are sometimes compelled to reduce the prices of food produce to prevent them from going bad. Market traders often create syndicates to take advantage of the situation and as a result the farmers do not receive the real market value for their goods. The market traders after buying from them make significant profits by selling it in the market at higher rates. During a male focus group discussion, a male farmer explained: "*…When the market is flooded with a particular food produce we are forced to reduce the price in order to sell it quickly because we do not have storage facilities. If we do not do that we are likely to lose everything. We don't*

have a problem of people coming here to buy from us but it's only about the low prices they want to offer when they come and buy from us" (Kpone, FGD Male Farmers, 07.04.15). The resilience of market traders, in such times, is bolstered / reinforced by the increased vulnerability of the farmers. Also, the irregular power supply affects fishers ability to store fish in the cold stores. Fishermen do not get enough ice packs to use at sea and the fishmongers, who are mainly women, are forced to reduce the price of fresh fish in order to clear their stocks quickly. With regards to fish storage, the fishermen are not as adversely affected by the irregular power supply as the fishmongers. This is because they sell off fish to the fishmongers as soon as they dock and the women have the challenge of storing whatever comes in. Women play a greater role than men in the processing, storage and selling of fish. Their inability to store fish using the cold stores adversely affects them. This demonstrates how patriarchal norms influence the gendered division of labour in the fisheries sector (Abane et al., 2013; Bennett, 2002; Villareal and Upare, 2003). Fishmongers become subject to the antics of fish traders who compel them to reduce prices to their advantage. To avoid losing money they sell to them at prices lower than the market value. The inability of fishers to store their fish catch reduces their income levels and this affects their ability to take care of the nutritional and educational needs of their households.

Almost every household in the community has access to electricity. However, at the time of the survey the nation was having a power crisis, this was affecting power supply. Respondents complained about consistent power outages. Most business activities in the fishing and informal community depend on electricity consequently their incomes are adversely affected by the frequent cuts in power supply than the farming community. The decreased supply of energy reduces output levels and often increases production cost. Better-off households who could afford it were using generators to keep their businesses going. The irregular supply of electricity also affects the ability of students to study at night. The youth also said that the irregular power supply was affecting their school work as they could not study at night. A youth said: *"Most of the times our power supply is cut, this affects our school work. When there is no light we can't learn, we strain our eyes when we use the torch light to study"* (Ashaiman FGD Youth, 15.03.15). All the three communities complained that electricity bills increased after the installation of the pre-paid electricity system.

6.1.5 Social Networks

Access to information influences households' vulnerability and adaptive capacity to climatic variability and change. Community members access information through the associations they belong too as well as their contacts with NGOs and other government organisations. It is within associations that community members share knowledge and information about best practises for improving their livelihoods as well as innovations and technologies that could be used to adapt to climate variability and changes. A female farmer noted: *"We benefit more from our farmers' association. We meet occasionally to discuss our challenges and learn some new methods of farming. Our farm extension officer is quite helpful in this regard"* (Kpone, Female farmer, 26.03.15). Structural constraints restrict the kind of information that reaches a household. Unlike better - off households, the very poor and poor are often excluded from social groups. They are therefore unlikely to have access to the information shared within such meetings which could help them improve their activities. They are more likely to be adversely affected by climate change impacts. Being part of an association is also useful as it helps group members access finance more easily from commercial lenders like MFIs who prefer group lending. Farmers and fishers belonging to associations have also been able to increase their bargaining power with market traders as compared to those who are not part of a group and have to deal directly with market traders who do not offer the right market value of goods. Members of an association also assist each other in difficult times.

In times of disaster such as floods family and friends often provide relief and assistance to those within their network before the arrival of external assistance. Better - off households with more social networks can draw on their connections for help as compared to poor and very poor households whose social networks are not wide. Better - off households often have links with local political leaders / local elites and tend to receive preferential treatment in accessing official government assistance and relief (Coirolo and Rahman, 2014). For instance, a respondent explained that NADMO, an organisation that provides relief for victims of disasters such as fire outbreaks and floods, tends to be selective in choosing those who receive the relief items. A male respondent explained: *"Every time there is a disaster like floods we have NADMO coming over, they come and write our names and promise to provide us with some relief items but we never hear from them again. Even when they come back they give us items*

that are not very useful. For instance, if I have lost a sack of rice they will only bring me about six cups of maize / corn. Those who know the big men do not go through this process and they always get a lot of relief items" (Ashaiman FGD Men 15.03.15). In the same way communities that have links with central government officials and NGOs can facilitate access to resources and speed up recovery after a disaster like flood. Also, communities with party faithful's can access relief items more easily than communities that are deemed as opponents.

Most often the poor and very poor households are those most adversely affected by key decisions taken by local authorities and policy makers. Policy decisions on water privatisation, land use changes and fisheries management impinge directly on the vulnerability and adaptive capacities of these groups, however their opinions are often not sought during the decision-making process. Marginalised groups are often poorly represented in decision-making meetings. The politically connected, local elites and local representatives who usually fall in the category of better-off households represent their communities at local and national level stake holder workshops and meetings. Most of these representatives do not communicate proceedings or decisions taken at such meetings to the people they represent. This communication gap limits the ability of the poor and marginalised to contribute in the decision-making process consequently their perspectives are not likely to be considered in final decisions.

6.2 Adaptation and Coping Strategies to Hazards

The interactions between climatic impacts such as floods, severe rainstorms, droughts, reduced rainfall and high temperatures coupled wth existing vulnerabilities affects the lives of households in the field sites. Households in the study communities have developed methods to cope with or adapt to climatic impacts. Adaptation to climate change refers to the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001: 365). Coping on the other hand is defined as the use of available skills, resources, and opportunities to address, manage, and overcome adverse conditions, with the aim of achieving basic functioning in the short to medium term (IPCC, 2014). Fabricius et al., (2007) distinguish between coping and adaptation strategies based on time-frame, aims, response types and learning. They characterize coping strategies as short-term and immediate strategies oriented towards survival

to unexpected climatic events. Coping strategies are often reactive and opportunistic responses. The opportunity for learning when using coping strategies is limited as it is mainly through individual experiences and innovation. Adaptation strategies on the other hand are long-term strategies that evolve over generations. They are oriented towards both survival to expected or future uncertainties and sustainable management of socio-ecological systems (SES). Adaptation strategies are often proactive and planned responses which provide extensive opportunity for learning though knowledge exchange, intergenerational transfer and institutional development. The distinction between coping and adaptation strategies is often blurred, what may have started as a coping strategy in exceptional years can become adaptation strategies for households or whole communities (Morton, 2007: 19681). Also what would be perceived as an adaptation for one household could be part of a coping strategy for another (Béné et al., 2014). This chapter will discuss how access profile influences households' adaptation and coping strategies. The chapter will also discuss how households adapt to or cope with changes through livelihood strategies of hanging in, stepping up, stepping out / livelihood diversification and migration.

6.2.1 Floods Coping and Adaptation Strategies

The major hazards that affect households in the study communities include floods, drought and diseases. In the study communities extreme weather events like floods have led to the damage and loss of property, the loss of lives, the destruction of settlements as well as social infrastructure. Markets and roads often become inaccessible after floods. The communities are highly exposed to floods because of the almost flat nature of the land, the terrain forms part of the coastal plains. Although floods occur in all the three communities there are areas in each of these communities where the situation is more severe. These include settlements along major drainage systems / waterways, settlements in flood plains, water logged, swampy and low lying areas. These unsafe places are often inhabited by migrants and low income earners because it is relatively cheaper to rent a house in such places.

To respond to severe storms and floods poor and very poor households mentioned that they clear and dredge drainage facilities before the onset of rains. They also make temporary channels to facilitate the flow of water. Most households fill their homes with sand or place concrete and sand bags in front of their homes to serve as a protection from floods. These

responses are used by a large number of households because it is inexpensive. They provide some temporary relief as a female respondent stated: "*Even though where I live also gets flooded. The house has been filled with sand so that water does not come into our house when it rains heavily. Those who have not filled their houses have water going in*…" (Tema, 06.02.15 Female fishmonger). The very poor who live in shops, kiosks and makeshift structures elevate their structures on stilts to keep it above flood waters. Some households also have simple early warning systems they use to detect the risk of flooding. A youth described one such method: *"Whenever it is raining my father measures the water level against the wall. This gives him an indication if there could be floods. Whenever he thinks there is a risk of flooding, he will ask us all to evacuate the house. We often go and seek shelter at the Valco flats because it is on a higher ground and a relatively more secure place"* (Ashaiman, FGD Youth, 15.03.15). To adapt to severe storms and floods better off households in the three communities construct concrete embankments / walls to prevent flood waters from entering their homes and shops. They also raise the floor foundation of concrete buildings.

Picture 6.2 Sand bags to prevent flooding

Source: Field study, 2015

Picture 6.3 Elevated makeshift houses

Source: Field study, 2015

Like most parts of the country the drains in these communities are uncovered. Some residents dispose their rubbish into these drains, sand and debris also collect in them creating a thriving environment for mosquitoes to breed and this increases the risk of diseases like malaria. To reduce the risk of flooding from choked drains as well as choked drains providing a breeding site for mosquitoes, households and community members organize clean up exercises to clean drainage facilities before the onset of rains. They also use insecticide-treated mosquito nets provided by health care centres and mosquito coils to keep away mosquitoes. To prevent contracting diseases like cholera and diarrhoea from water sources that are likely to be contaminated / polluted after floods, better off households who can afford it purchase and drink packaged sachet water, they also get their water supplies from private tankers. In Poorer households the decreased supply of water puts an additional burden on women who have to travel longer distances in search of water.

Households with wide social networks relocate temporarily to live with family and friends. As a focus group participant explained: "… *After the floods recede we have to find a place to sleep in the meantime whilst we wait for the rooms to dry up. It's only because we don't have money to rent a house in a safer place that we are still here*" (Tema, FGD Fishmongers, 11.02.15). During floods, they only take out the property that they can salvage and leave the rest to go.

Some households have had to relocate permanently from areas that are highly prone to flooding. They also place their most valuable properties on shelves, tables or cupboards to prevent them from being damaged. To avoid losing their fish to floods the fishmongers said that they stock less fish when they anticipate heavy rainfalls.

In all the three communities, authorities sometimes dredge major canals and construct drainage systems to allow the free flow of water. Respondents in the informal community reported that after the major floods in 2010 the Municipal Assembly tried to improve the drainage systems in the community by constructing some drains, dredging the silt from major drains and widening some roads to facilitate the flow of water. They also expanded bridges over some major drainage systems and pulled down unauthorized structures on and near waterways to prevent the reoccurrence of floods in the community. Although demolition exercises help to prevent floods it has adverse impacts on those whose property are pulled down. When houses are pulled down it renders victims homeless they are therefore forced to stay with family and friends. As structures built on water ways are considered illegal, property owners do not receive any compensation from the government nor are they provided with alternative accommodation. The government also constructed some sea defence walls in the Tema metropolis to reclaim land for fishing activities and to also protect the land from inundation.

In the farming community floods affect crop yield. High rainfall coupled with the flat topography and low soil permeability results in water logging which causes crop failure. It also leads to leaching and soil erosion which reduces the soil fertility. Excessive rainfall and high temperatures also brings about insects and diseases which damage crops grown. Majority of the farmers claim they make temporary channels for the rain water to flow through so their beds do not flood during heavy rainfalls. They plant crops on raised mounds or beds to improve drainage / to avoid excess moisture. Some of them stated that they move the animals they rear to slightly higher ground. To address soil infertility, pest and diseases, better-off farmers purchase and use agro-chemicals (herbicides, pesticides and fertilisers). Although the government subsidises some agro-chemicals, in a crisis situation it is only better-off farmers who have connections with the suppliers who are able to access it. Through the remarks they made it was obvious a few farmers were resigned to their fate with regards to dealing with floods on their farms. They stated that there is nothing much that they can do to reduce the

impact of floods on their farms. A farmer said: *"Whenever our farms flood we just wait for the waters to recede and then replant the same crops or grow a different type of crop altogether …what else can we do?"* (Kpone, FGD Male Farmers, 07.04.15). The farmers noted that severe weather events like floods affects subsequent farming seasons. Farmers' inability to access funds or any other form of support to help them deal with crop failure increases their vulnerability levels. If unaided they take a relatively longer time to recover from such shocks. During a focus group discussion, a farmer explained: "*When floods destroy our crops we lose everything we have invested in our farms. The seeds, the fertiliser we buy, the tractor services we pay for ... we are left with little or no money. Even if there is any money left most of us are scared to put it into farming again. To be able to start farming again we have to reorganize gradually…*" (Kpone, FGD Male Farmers, 07.04.15).

6.2.2 Drought Coping and Adaptation Strategies

In anticipation of periods of water shortages, most households harvest and store rain water. They store water in water storage tanks and barrels. The amount of water households store is influenced by the space available to them and their ability to buy bigger and durable storage tanks. Better-off households have larger storage tanks so the water they store can serve them for a longer period. They can also afford to purchase water from private water tankers. Buying from water tankers is often associated with high costs. During periods of droughts poorer households have to travel further or go longer distances in search of water and in most instances the girls and women go in search of water. Most households buy and drink packaged sachet water at such times.

Picture 6.4 Water storage tanks and gallons

Source: Field study, 2015

In the fishing and informal community in particular, during periods of drought when food prices increase poor and very poor households cope by purchasing less food during such periods. This increases the risk of malnutrition amongst children and leads to higher rate of diseases amongst these groups. They cut down on the number of meals they eat per day and resort to purchasing more of their cooked food from street vendors. By doing this they can save costs on fuel for cooking. The money they save can then be used to get more food. They also buy food from street vendors because they do not have enough money to buy food in bulk quantities although this could be relatively cheaper than buying food from outside. Studies of informal settlements in developing countries show similar patterns of low income families consuming street food when food prices increase (Cohen and Garrett, 2010; Tacoli et al., 2013). Better-off household's draw on food they have stored over time or on their social networks for assitance.

Agriculture in the farming community is mostly rain fed. Most of the farmers in the farming community depend heavily on rainwater for their plants, the absence of rainwater affects crop growth and yield. To adapt to prolonged dry seasons and droughts in the farming community, Better-off farmers mostly the male farmers whose farms are close to water sources irrigate their farms. They buy water pumps, pipelines and fuel for irrigation. Irrigation often enables farmers to grow crops all year round. The 2014 MOFA annual report states that the use of

informal irrigation by some farmers in the Greater Accra, Upper East, Volta and Eastern Regions of the country has enabled them to have three cropping cycles in a year (MOFA, 2014). Although it can allow farming throughout the year, farmers who practise irrigation farming claim they spend a lot of money on fuel for their water pumps. Therefore, during periods of droughts their farm expenditure also increases. During the dry season, it is only those who can afford to buy fuel on a regular basis who can practise irrigation farming. A farmer reported: "*When there are no rains we spend a lot of money buying fuel for our pumping machines. I buy about GHS 50.00 worth of fuel each time I have to water my crops. You cannot use a pumping machine if you don't have money. To avoid incurring this cost some farmers do not farm at all during the dry season"* (Kpone, FGD Male Farmers, 07.04.15).

Picture 6.5 Water source and water pump for irrigation

Source: Field study, 2015

In the farming community male farmers tend to have a higher likelihood of farming near water sources and owning irrigation facilities than their female counterparts. The differential access to environmental resources is often as a result of unequal power relationships that exist between men and women and this tends to affect vulnerability levels. This finding validates previous studies by (Denton, 2002; Nelson et al., 2002; Singh et al., 2010). Unlike the male farmers who can have about three production cycles in a year because of their location to streams and their use of irrigation facilities, female farmers claim they farm only when they expect the rains. Most of the female farmers here do not farm close to water sources so during the dry season it is difficult for them to grow crops. A female farmer stated: "*We do not have*

regular supply of water; we wait for the rains. If the rains do not fall, then we cannot grow the crops. Personally, I cannot buy and carry water to the field so when there is no water I just stop farming" (Kpone, Female Farmer 26.03.15). For those who attempt to farm in the dry season they are forced to buy water for their crops which they claim is expensive. The inability of women particularly female headed households to farm at certain times of the year increases their vulnerability levels as their income levels decline at such times. In most households, the men are responsible for paying school fees and providing money for food, the women supplement this when they can. However, in instances when the men fail to do this the responsibility falls on the women decreasing the amount of money they would have to spend on food and on themselves. Lower incomes would therefore mean a decline in the well-being of the family.

To adapt to drought, better-off farmers tend to grow drought resistant varieties. The majority of the farmers have changed their planting dates for some crops. Although planting late could increase the risk of pests and diseases some farmers only plant their maize seeds when the rains are well established so that they can have water at the flowering stage. Farmers also diversify the crops they grow. A farmer who uses improved varieties explained: *"I have changed the seeds I grow. I buy very expensive seeds (resistant varieties). These can survive when there are changes in the weather. The common/ordinary ones which most farmers plant costs about GHS 40.00 but the resistant variety is about GHS 200.00. It's not easy for people to buy this type"* (Kpone, Male Farmer, 24.03.15). **Table 6.1** below provides a summary of the adaptation and coping strategies in the study communities.

Table 6.1 Summary of Adaptation / Coping Strategies in the Study Communities

Community	Hazard	Coping Strategies	Adaptation Strategies
		LIVELIHOOD	**LIVELIHOOD**
Fishing	Floods	Stock less fish	Diversifying livelihood sources Migration
Farming	Floods Pests and diseases Drought	Using agro-chemicals (herbicides and pesticides)	Growing drought resistant varieties Diversifying livelihood sources Migration Crop diversification

Community	Hazard	Coping Strategies	Adaptation Strategies
			Changing planting dates Plant crops on raised mounds or beds to improve drainage / to avoid excess moisture Using fertilisers
Informal	Floods		Diversifying livelihood sources Elevate kiosks/shops on stilts
		WATER	**WATER**
Fishing **Farming** **Informal**	Drought Erratic rainfall	Drinking packaged sachet water Purchasing less food Cutting down on the number of meals per day Buying food from street vendors	Irrigation Harvesting and storing rain water Using water storage tanks Changing planting dates
		HEALTH	**HEALTH**
Fishing **Farming** **Informal**	Floods Drought	Use of mosquito coils Drinking packaged sachet water	Provision of bins and trucks to carry rubbish Cleaning drainage facilities Cleaning surroundings Use of insecticide-treated mosquito nets
		INFRASTRUCTURE & PROPERTY	**INFRASTRUCTURE & PROPERTY**
Fishing **Farming** **Informal**	Rise in sea-levels Floods	Moving to secure places before the start of rains Constructing temporary drainage channels (at home and on farms)	Make shift structures that have been elevated Clearing and dredging drainage facilities before rains Placing sand bags in front of houses Raising the walls in front of houses

Community	Hazard	Coping Strategies	Adaptation Strategies
		Placing valuable properties on shelves, tables or cupboards Relocate temporarily to live with family and friends	Constructing drains Dredging the silt from major drains Widening roads to facilitate the flow of water Expanding bridges over major drainage systems Constructing embankments in front of houses Demolition of unauthorized structures on and near waterways constructing sea defence walls Relocation/resettlement

Source: Field study, 2015

6.2.3 Livelihood Strategies

6.2.3.1 Migration

Results from the study show that seasonal migration is the main livelihood strategy that farmers and fisher folks deploy to adapt to climatic changes. It is not a common strategy amongst slum dwellers most of whose livelihoods are not affected by seasonality. In both the farming and fishing community, women are often unable to migrate because of child care and household chores. Fishers in the study community sometimes travel to other towns within the country as well as other countries within the West Africa region to fish. Farmers migrate seasonally to other towns and villages in the country. Unlike farmers who have higher chances of improving their livelihoods through migration, travelling further does not guarantee an increase in fish catch for fisher folks. In both communities the access to assets plays a major

role in an individual's ability to migrate. In the case of fishers' better-off households have to accumulate productive assets which are often cost intensive before migration can take place. Whereas based on their social networks farmers who migrate are able to have access to productive assets like land at their destinations.

Migration in fishing takes many different spatial and temporal forms (Bortei-Doku, 1991). Migration of fishers is defined and classified based on scale, the periods of movement, distance and patterns of behaviour (Bortei-Doku, 1991; Njock and Westlund, 2010; Randall, 2005). Njock and Westlund (2010) define eight different categories of migration relevant to marine artisanal fisheries in West and Central Africa. These include international, internal, short-term, seasonal, long-term, permanent, contractual and stop-over migration.

Fishers in the study community practise mainly short-term migration. Short-term migration usually lasts for a few weeks (1 – 4 weeks) but is less than a fishing season. Fisher folk mentioned that as fishing stocks are dwindling they must sometimes travel to other countries like Benin, Togo, and Nigeria to fish. Some also said they fish in the Central region of the country (Senya Breku and Apam). They stated that going further does not necessarily guarantee an increase in fish catch. During the focus group discussions, some fishers explained*: "Now we have to travel as far as Togo, Benin and Nigeria to fish... If we do not travel this far to fish, then the owner of the vessel will be running his business at a loss. To travel this far we spend over GHS 2000.00 as we have to stock ice packs, buy fuel.…When we do not find fish to catch we sometimes have to stay longer at sea than originally planned as we cannot come back home empty handed especially after we have spent money to buy fuel and also packed ice in our canoes. We have to be able to render accounts to the owner of the canoe on our return"* (Tema, 10.02.15 FGD Fishermen). In order to go further to fish, fishers have to accumulate productive assets like improved fishing gears, more gallons of premix fuel. These assets are cost intensive and can only be acquired when they have access to financial assets like savings / loans. Hence only the groups that can afford this can migrate to go fishing. During focus group discussions, female respondents mentioned that even though sometimes they would like to travel to other places to work / improve their lives they cannot do so easily because of their children.

Depending on the season and the type of crops they want to grow some farmers migrate to other towns and villages for farming. Most migration however takes place in the dry season i.e. from December to about March. During a focus group discussion, a farmer indicated: "*I have some farms at Begoro (in the Eastern region) and Agogo (in the Ashanti region) so I usually go there to farm during the harmattan season. I have nursed some crops at Agogo and already finished harvesting some crops at Begoro*" (Kpone, FGD Male Farmers, 07.04.15). Farmers who can migrate to farm elsewhere often have access to productive assets like land in the places they go to. They noted that based on their social networks, particularly their family ties in some of these places they are able to acquire land for farming. Most often farmers who migrate have social networks at their destinations who assist them to acquire assets necessary to earn a living. Female farmers revealed during focus group discussions that due to child care and household chores they are unable to migrate seasonally like the men to farm elsewhere. Ghanaian women spend more than twice as much time on domestic work as men (WEDO, 2008). Due to socially constructed gendered roles, women tend to spend a lot of their time on household work which is often unpaid work than they would on productive roles for which they can earn wages (Awumbila and Momsen, 1995; Brody et al., 2008; Singh et al., 2010).

6.2.3.2 Livelihood Diversification / Stepping Out

The main livelihood strategy employed in all the study communities is income diversification. Households tend to engage in more than one activity to sustain their income levels and to also help reduce vulnerability levels. Activities engaged in include petty trading, selling of clothing, fabrics, food products and cooked meals. A fishmonger during the FGD said: *"Sometimes we sell other food products like cooking oil and rice... If we do not do this, we cannot survive especially in taking care of our children"* (Tema, 11.02.15 FGD Fishmongers). Petty trading plays a particularly important role in livelihood diversification irrespective of the season or time of the year it can provide some income and food. Those who trade in food products mentioned that in difficult times the items they sell also provides food for the family.

Off - farm income from activities like petty trading is useful in reducing vulnerability levels amongst farmers. It often ensures that famers have access to income and food throughout the year regardless of the season. In addition to farming some of the farmers reported that they

also engage in selling of cattle [11] packaged food products and cooked meals. Livelihood diversification helps to sustain income levels. It also provides additional income so that households can step up their activities by investing in some productive assets such as land for farmers and fishing gears for fishers. A farmer reported: *"I generally make more money from farming and then use the proceeds to continue with other businesses"* (Kpone, Male Farmer, 23.03.15). Fishers and farmers consider fishing and farming as their main source of livelihood as it generates a higher source of income when compared to the other activities they engage in. The aspirations of households in the study communities to step up and/or step out in their livelihood activities is often hindered by their limited access to productive assets.

Livelihood diversification also enables farmers to step up their activities by investing in both the quantity and quality of the lands they own. As land becomes expensive it's only farmers with off-farm income who can afford to buy or rent more land for their farming activities. They are also the ones who can purchase inorganic fertilisers, improved seed varieties and other farm inputs to increase the productivity of their farm lands. The ability of a household to diversify livelihood sources is dependent on the assets available to them. Better-off households who have access to a wide range of assets particularly productive assets can combine these assets to widen their income earning portfolio to cover shocks or stresses. Most of the respondents have limited livelihood options because of their inability to access capital. Households that are unable to access financial capital and other productive assets often have limited livelihood options and increased vulnerability levels.

In the fishing community women tend to diversify their livelihood sources more than the men. The men consider their spouses' business ventures as an alternative source of livelihood for the family, they sometimes support them financially. In the informal community children often drop out of school in order to work to support their parents. Limited supervision from parents working multiple jobs often leads to an increase in social vices (Moser, 1998).

Families composed of mainly adults tend to have greater opportunities for diversifying income sources than those with an increased number of dependants. Average household size of respondents in this community is between six – ten people. In many households both the men

[11] Farmers buy cattle from herders in Northern Ghana or Burkina Faso and bring it down to sell in the South.

and women diversify their livelihood sources. Income from working household members, men and women is often pooled and used to acquire assets that can sometimes be used to step up activities. Diversifying livelihoods also enables families to recover more easily from shocks and stresses as households are not dependent on one livelihood source.

One of the challenges associated with the urban poor diversifying income sources is that often families with a greater proportion of household members being children tend to send their children off to work to support the family instead of allowing them to go to school. Children are engaged in street vending activities like selling of sachet water, fruits and snacks. In a study by (Garrett, 2004) of some developing countries, about 5 – 10 % of children of the poorest families in urban communities in Egypt, Ghana and Peru are reported of having or seeking jobs, with boys having a greater tendency to be in the labour force than girls. There are also social costs when parents increase the activities they engage in (Moser, 1998). Often in their quest to earn more parents neglect their children. The lack of parental supervision increases the risk of children engaging in social vices.

6.2.4 Livelihood Strategies and Outcomes

Analysing the livelihood strategies for these communities show that many of the respondents in the three communities are hanging in with their livelihood strategies. Their livelihood activities are mainly on a subsistence basis , living from hand to mouth. This is mainly because of their limited access to productive assets. The very poor and poor who make up majority of the population in these communities depend on other social actors for the productive assets necessary for the pursuit of their livelihoods (as discussed in section 6.1 above). Their dependence on the assets held by others to generate an income makes their livelihoods unstable and increases their vulnerabilities. They are often exploited in these relationships.

In the fishing community fishermen and fishmongers who are mainly among the poor and very poor households have higher vulnerability levels, they are more likely to be hanging in with their livelihood strategy and less likely to step up their fishing activities when compared with canoe owners and cold store operators. Although not so easy the canoe owners and cold store operators are more likely to step up and invest in their fishing activities this raises their income

and gives them the opportunity to invest in other business ventures. Comparatively it makes them relatively less vulnerable.

The poor and very poor farmers in the farming community also have limited access to productive assets like land and water which is essential for farming. Their dependence on landlords for productive assets like land and insecure land tenure systems puts them in a precarious position and increases their vulnerabilities. Only a few better-off households are able to step up their farm activities. In the farming community female farmers have higher vulnerability levels than their male counterparts because of their limited access to productive assets like land and water as well as their inability to migrate. In most instances female farmers, farm smaller plots of land because they cannot afford to pay for labour and / or because they have limited access to land. Unlike some of the men who farm throughout the year majority of the female farmers' farm only once or twice in a year because of their limited access to water and irrigation facilities. They are also unable to migrate during lean seasons to engage in other activities or farm elsewhere.

Majority of the respondents are hanging in with their livelihood strategies. Most of them work in the informal sector where jobs are often irregular, insecure and low-paying. In the informal community vulnerability levels are higher particularly amongst tenants. As a result of increasing rents from landlords' households spend a large proportion of their income on housing costs. Furthermore, increasing food prices has an adverse effect on the food security of low income households. The marginal increases in incomes achieved by households that attempt to diversify their livelihood sources are quickly depleted by paying for the high cost of public services and rent. Inadequate access to public services like water and sanitation increases household expenditure as they spend a large proportion of their incomes to get access to these services. Water insecurities and poor sanitation negatively affects the well-being of residents.

Most of the households in the community diversify their livelihood sources as a measure of adapting to climate variability and change. Livelihood diversification cushions them from shocks and stresses. Due to low incomes, the precarious nature of their activities and the unequal power relationships that exist in the various communities, majority of the households are unable to step up to increase their productive capacities making them more vulnerable to

shocks and stresses. Most of the households have alternative sources of livelihood. A household's ability to diversify its livelihoods is based largely on their access to productive assets. For instance, better-off farmers who have access to a larger amount of capital engage in non-farm activities that bring in a higher source of income like buying and selling cattle whereas those with limited capital are more likely to engage in petty trading.

The livelihood strategies employed by households in the study communities helps them to attain some marginal improvement in food security and some increase in income levels. This is often not sustainable and cannot keep pace with the rate of change occurring. To allow for more sustainable livelihood outcomes particularly reduced vulnerability levels institutional support would be required.

This chapter has analysed how social relations of power affect access to resources and decision making, and their implications for vulnerability and adaptive capacity in the field sites. The chapter discussed how unequal power relations bring about entrenched inequalities and dependencies in the face of climatic changes. It also discussed how access influences the capacity of households to adapt to / cope with climatic impacts. The next chapter will examine the role that policy plays in addressing vulnerabilities to climate impacts in the study communities.

CHAPTER 7

7.0 CLIMATE CHANGE POLICY PROCESSES AND LOCAL VULNERABILITY

This chapter discusses how national level policies / interventions interact with vulnerability and adaptation at the local level. It looks at the role that policy plays in addressing vulnerabilities to climate impacts in the study communities. The chapter also analyses the ways in which adaptation policies address the structural / root causes of vulnerability. It examines the role of donors in the policy process and the extent of local participation in decision-making. It also discusses how prevalent narratives and institutional perception influences policy responses / initiatives.

7.1 Addressing Vulnerability in National Policy Documents

This section discusses policy documents that are relevant to findings in the field site. These include policies covering land access, illegal fishing as well as urban planning. The section also discusses how these national level policies / interventions interact with local level vulnerability. It also analyses the policies to find out if they are addressing the structural / root causes of vulnerability and their effects on vulnerability and adaptation.

7.1.1 Land Reforms – The National Land Policy

One of the policies impinging on vulnerability in the study area particularly the farming community is the Land policy. Recent land policies / reforms that have been implemented have taken a neoliberal approach where land is treated as a market commodity. These reforms have encouraged the commoditisation of land, increased inequalities and supported elite capture. Marginalised groups have been neglected in the design and implementation of these policies. These Land reforms are perpetuating rather than reducing vulnerability to climate variability and change for poor and very poor farmers.

The first National Land Policy (NLP) was introduced in Ghana in 1999. This policy aims to ensure the judicious use of the nation's land and all its natural resources by all sections of the

Ghanaian society in support of various socio- economic activities undertaken in accordance with sustainable resource management principles and in maintaining viable ecosystems (Ministry of Lands and Forestry, 1999: 6). The Land Administration Project (LAP) was launched in 2003 to facilitate the implementation of the National Land Policy. The Ministry of Lands and Natural Resources received funding from the World Bank to implement this project. The project which is valued at USD 55 million began in 2003 and is expected to last 20 years. The project aims to increase the extent of land titling, facilitate the creation of community-based registration facilities managed by traditional authorities, minimize boundary disputes, and harmonize statutory and customary land laws through policy, legal and institutional reforms (Jones-Casey and Knox, 2011: 3).

In this policy, the lack of registered title of land is considered the major constraint influencing land security of the poor. Formal land registration is expected to reduce insecurities associated with accessing land so as to attract investors and facilitate investments (Wily and Hammond, 2001). It is also expected to protect landowners and their descendants from becoming landless and curbing the incidence of land encroachment and multiple land sales (Obeng-Odoom, 2016). In conceptualising the problem of land access as one of land tenure the underlying unequal power relations that exist which prevent the poor and marginalised from having access to land is ignored. Obeng-Odoom (2010) argues that the activities of the LAP are likely to increase land values which will accrue to the rich.

The reform has been plagued with some challenges particularly for the poor. The high cost of registration of land leads to the exclusion of the poor. The registration of land involves the costs of survey, legal and administrative fees and payments to landlords/chiefs to allow the interest to be registered. These costs are sometimes close to the cost of buying the land (Wily and Hammond, 2001). Also, the programme has not been able to facilitate the registration of land because of the lack of administrative capacity and weak public outreach. Some claimants have also taken advantage of the poor coordination of the system and register titles without other claimants' knowledge (Jones-Casey and Knox, 2011).

The role / mandate of chiefs as custodians of land is not clearly defined in both statutory and customary law. There are no explicit regulations regarding how they should consult with affected communities and individuals before selling / leasing land neither are there explicit

regulations on how they should compensate those who have lost their lands (Wily and Hammond, 2001). As a result of this some chiefs, clan heads or family heads who are custodians of the land no longer consider it their duty to negotiate equitable land access for diverse land users and are taking advantage of the situation to make personal gains. They neglect the livelihood concerns of poor farmers and sell off productive farmlands or grant long term leases to investors to use as residential plots or for the building of industries. These decisions are often unfavourable to poor marginalised famers in the community. The loss of farmland makes them unable to grow enough food to feed their families. This further exacerbates the vulnerability of poor farmers to climatic impacts. The rising demand for land has made it more difficult for the poor to access land. Previously natives or community members could access communal land by offering a gift or some money for drinks to the custodian of the land, however in recent times chiefs require large sums of money which the poor cannot afford (Wily and Hammond, 2001).

Also, the neoliberal approach that recent land policies have taken which has led to the commodification of land indirectly drives anthropogenic climate change. The sale of land to investors for residential plots or for the building of industries leads to the clearing of large portions of pristine vegetation or forests. It also leads to the destruction of sites which were previously conserved. The cutting and burning of pristine vegetation or forests releases tons of carbon dioxide into the atmosphere. Forests / pristine vegetation play an important role in the carbon cycle. When they are cut down their function of absorbing carbon ceases. Also, when they are burnt down the carbon stored in them are released into the atmosphere as carbon dioxide[12]. The accumulation of carbon dioxide in the atmosphere leads to changes in local climate patterns such as increased temperatures and changes in rainfall patterns.

7.1.2 Urban Policies – The National Urban Policy

Urban planning in Ghana also impinges on vulnerability in the study communities. Urban planning in Ghana has been largely influenced by colonial spatial planning and has mostly been top down. The focus has been more on ensuring spatial order rather than addressing issues of poverty and inequality. Urban planning which follows colonial spatial plans does not

[12] http://www.climateandweather.net/global-warming/deforestation.html

accommodate poor and informal communities. Top down planning of urban cities excludes the informal communities from formal ones.

Current urban planning regulations demand that an individual should have a building permit in order to construct a building. The process for applying for a building permit is a long and expensive process, which most poor people cannot afford. Some of the documents required before obtaining a building permit include approved building plan, land title and a quantity surveyor's report. The inability of low-income households to obtain these documents has displaced them to cheaper land on the urban periphery or to illegal informal settlement where these rules are often not enforced. Also, authorities do not make efforts to provide basic public services like water and sanitation facilities in such places. The focus is often on the planned communities creating further social and spatial inequalities.

Fält, (2016: 472–473) notes that unlike previous urban agendas that criminalise the presence of urban informality / informal settlements in the country, the country's first National Urban Policy (NUP) explicitly targets disadvantaged and vulnerable groups and seeks to prevent socio-economic and spatial inequalities in cities. In addition to this the policy also emphasizes the importance of physical planning and spatial order.

As stated in the policy: *"This National Urban Policy document makes a bold statement to promote socioeconomic development of Ghanaian urban centres – a development process which is all-inclusive and takes account of the needs of disadvantaged and vulnerable groups. In addition, it adheres to the country's environmental policy by advocating for all environmental concerns to be incorporated in all decision making about urban development. The NUP is also in accordance with Ghana's Habitat Agenda. More importantly, it makes far reaching proposals in an Action Plan for implementation in order to arrest rising inequalities in socio-economic and spatial terms and advance towards sustainable development"* (NUP, 2012: 12).

"The goal of the National Urban Policy (NUP) is to promote a sustainable, spatially integrated and orderly development of urban settlements with adequate housing, infrastructure and services, efficient institutions, and a sound living and working environment for all people to support the rapid socioeconomic development of Ghana" (NUP, 2012: 21).

The aim of the policy to achieve spatial order and at the same time target disadvantaged and vulnerable groups in cities is quite ambitious. Urban policies seeking to achieve spatial order often cannot protect the poor and vulnerable groups in the cities. Such policies have often been used to justify eviction exercises and the demolition of structures. The motive for implementing some of these exercises has been to make some profit. Authorities connive with private-contractors for urban development projects and in the process, evict the poor living in illegal structures. Those evicted are neither compensated nor offered alternative homes. Ruling parties may also use eviction exercises to manipulate, seek political gain or political control. Informal communities considered as political opponents could be evicted, whilst those considered party supporters would be allowed to stay in their settlements. Informal settlers cannot be blamed wholly for the siting of illegal structures. The lack of capacity of authorities to enforce building codes and regulate where buildings are constructed also plays a role and this often leaves the poor in a vulnerable situation. Most buildings on water ways are built without the knowledge of city authorities it is only after floods that they begin to identify and pull down some of these illegal structures in an effort to control floods.

The inability of urban policies to support the activities of poor urban populations working in the informal sector also contributes to further poverty and marginalisation of the urban poor. It exposes communities to climate variability and change. Planned urban projects provide limited places / space for their activities. The informal economy is often not factored into the urban development process. Those who sell their goods as street vendors are usually viewed as undesirable and are strictly controlled or excluded. They are considered to affect the aesthetic appearance of the city. Even, when they are factored they are provided spaces in the outskirts of town where patronage of their products is likely to be lower. As most households use their homes as a unit for production they lose their source of income in this process. Planned urban projects provide limited places / space for the activities of informal workers.

7.1.3 Fishing Policies

Illegal, unreported and unregulated (IUU) fishing is one of the biggest challenges of the fishery sector. In Ghana both industrial and artisanal fisheries have been implicated in illegal fishing practises. Some of these practices include the use of unlicensed vessels, fishing in prohibited zones, the use of illegal nets, the use of lights in fishing and under-reporting fish catch. The

government has attempted to address this challenge through the formation of Community-Based Fisheries Management Committees (CBFMCs). In 1997, with funding from the World Bank, the CBFMCs was launched to provide a new approach to managing the challenges of Ghana's marine fisheries. The fisheries co-management programme is a decentralized structure where the responsibility for managing fishery resources is shared between the government and local communities (CRC, 2010). The central government is responsible for policy formulation, monitoring and evaluation, while implementation is under the district assemblies and Community Based Fisheries Management Committees (CBFMCs). CBFMCs work together with the chiefs and the fishers to ensure the adherence to fishing rules and by- laws and in the long run the sustainability of the fishery sector. The CBFMCs enforce national fisheries laws and local by-laws at the community level.

To a large extent these committees were unable to enforce regulations to reduce IUU fishing. They could only regulate the activities of canoes that operated from their landing site and could not influence the semi-industrial and industrial vessels that were also practising illegal fishing. The system also led to unequal power relationships between fishers and influential committee members who were to ensure the adherence to the rules and by-laws. The committees mostly consisted of influential older men and a few influential women. Marginal groups such as poorer fishers were not represented (Overa, 2011). The enforcement of rules was sometimes influenced by committee members who were vying for positions as local leaders. Offenders supporting them were not punished when caught but those who did not support them were sanctioned for offences committed.

At the national level, the Ministry of Fisheries and Aquaculture Development (MOFAD) installed Vessel Monitoring System (VMS) on all industrial Ghanaian registered trawl fishing vessels in order to facilitate monitoring at sea[13]. It also established the Fisheries Enforcement Unit (FEU) to strengthen the capacity of the ministry to combat illegal fishing activities in the country. The staff of the FEU are drawn from the Ghana Navy, Marine Police of the Ghana Police Service, officials of the Fisheries ministry, Ghana Air Force and the National Security.

[13] http://www.mofad.gov.gh/?q=content/notice-all-industries-ghanaian-fishing-vessels-regarding-requirement-vessels-monitoring-1

The FEU has a staff strength of 55 personnel seconded from their respective institutions[14]. This unit is mandated to arrest and sanction both artisanal and industrial fishers involved in IUU fishing. The lack of resources, personnel, and logistics affects the ability of the FEU to monitor and enforce regulations. The long coast line leads to high costs of surveillance and this often serves as a deterrent to Monitoring, Control and Surveillance activities (MCS) by the FEU. The country has a coastline of about 550 km, which covers a maritime domain of about 228000 km^2. Generally, there is a weak and limited capacity of the government to monitor and enforce regulations in the fisheries sector, this tends to leave space for illegal fishing in the country. Most countries in West Africa have long coast lines but lack the systems and resources necessary to be able to patrol regularly and effectively and to also monitor and track the activities of fishing vessels in its Exclusive Economic Zone (EEZ) [15] (Daniels et al., 2016).

Authorities have often not been stringent in enforcing laws as they do not want to lose votes during elections. When fishers lose their livelihoods because of the enforcement of laws this could affect voting patterns as fishers are a large population, and this could lead to a loss of votes. Some politicians sometimes defend offenders when they are arrested in order to make political gains. The need to stay in power trumps all else and affects enforcement. As most top officials are shareholders or own DWFs they tend to constrain the efforts of the FEU some are alleged to connive with foreign DWFs to break the laws.

Projects or programmes implemented to improve the capacity of fishers are often used by politicians to win an election. For instance, the subsidised premix fuel program has often been used as a campaign promise to garner votes. Although considered a perverse incentive that leads to the over exploitation of fishing stocks it has been maintained by various governments. For fear of losing votes politicians are unwilling to implement policies which are essential but could negatively affect their voting base. The Fuel subsidy programme leads to inequalities further exacerbating fishers' vulnerability to climatic impacts. The premix fuel which is meant

[14] http://www.mofad.gov.gh/?q=content/improving-fisheries-law-enforcement-combat-illegal-unreported-and-unregulated-iuu-fishing

[15] An Exclusive Economic Zone (EEZ) comprises an area which extends from the coast, (3 to 12 nautical miles, in most cases) to 200 nautical miles (370 kilometres) off the coast. Within this area, nations claim and exercise sovereign rights and assume jurisdiction over the exploration and exploitation of marine resources (UNSD, 1997).

to help artisanal fishers increase their catch and consequently increase their incomes is often diverted onto the black market by the suppliers making it impossible for the marginalized who are the target population to access it in this way it loses its purpose. Although the Landing Beach Committees (LBCs) who manage premix fuel at the community level are permitted to put slight margins on the sale price for community development programmes as well as the welfare of the fishermen. Profits made have often not been used for such purposes. The leaders of these committees do not account to the locals and have used profits for personal purposes enriching themselves at the expense of poor and marginalised fishers creating further inequalities in the community.

7.1.4 Local Communities' Participation in Decision-Making

In the decision making process local communities operate mainly through popular spaces such as fisher group associations, Farmer Based Organisations (FBO) and associations within the slums. They are often represented by their local leaders, chief fisherman, chiefs and local NGOs at invited spaces created (from above) by government organisations. Although invited to participate in stakeholder meetings most of these groups tend to have little or limited policy influence in the policy process. Wolmer et al., (2006: 43) argue that invited participation is often on the hosts' terms, therefore familiar patterns of dominance and exclusion are replicated.

The ability of local communities to influence policy is also limited by the stage at which they are invited to participate in consultations. The stage at which various stakeholders are invited to participate in decision making is crucial to the level of influence they could have. Representatives of local communities often engage in consultative workshops meant to review or validate interventions. Often at this stage participants, are required to endorse decisions rather than make inputs. The opportunity to influence a policy is often highest at the initial phase. Mohammed (2013) argues that the participation of stakeholders is essential at the policy-initiating stage as it helps problems to be defined and addressed from multiple perspectives.

Wily and Hammond (2001) report that the formulation of the National Land Policy (NLP) took several years. Although experts were consulted in the formulation of the NLP there were no stakeholder meetings to have the opinion of local communities or identify their concerns. The

experts did not also have a platform to share the challenges they encountered when devising the policy. Even chiefs who are the major body of tenure administrators in the country were not fully involved in the decision-making process. As this was a sensitive policy, policy makers tried to avoid contention by avoiding consultative workshop with relevant stakeholders. The limited participation of relevant stakeholders negatively affected the efficient implementation of the policy.

The representatives of local communities often do not communicate proceedings or decisions taken at stakeholder meetings to the people they represent. This communication gap limits the ability of local communities to contribute substantially to the decision making process consequently their perspectives are not likely to be taken into account in final decisions. Farmers for instance have many independent Farmer Based Organization (FBOs) and cooperatives that seek to represent them. Salifu et al. (2010) estimate that there are about 10,000 FBOs and cooperatives in the country. These groups need to come under an umbrella organization in order to strengthen their voice and increase their influence in decision making.

7.2 Institutional Understanding of Climate Variability and Change and Adaptation in the Local Communities

This section discusses how prevalent climate narratives and institutional perception influences the policy responses/initiatives that are taken in particular sectors. It also examines how climate change narratives are being used to support neo-liberal ideologies which give rise to vulnerabilities.

7.2.1 Institutional Framing of the Climate Change Problem

Various narratives have been used to frame the climate change problem these narratives have often influenced the proposed responses to addressing climate change challenges. At the national level, the climate change-agriculture debate is framed as a development agenda. Climate change is seen as posing a major threat to national development (GSGDA, 2010). In the national framing climate change is considered important because it affects agriculture, a sector considered central to livelihoods and economic activity. The agriculture sector is considered the largest employer within the Ghanaian economy. About 70% of the population depends directly or indirectly on agriculture (crop, fisheries and animal farming) and the forest

sector for both timber and non-timber forest products, however this sector suffers the most from climate change. As agricultural production is predominantly rain-fed any changes in rainfall pattern would have serious impacts on productivity and national growth (NCCAS, 2012). The government therefore seeks to respond to this threat as part of its development agenda (NCCP, 2013).

Interviews with institutional actors in NGOs, government organisations and research institutions also revealed that climate change - agriculture narratives are centered on livelihood and food security. In the Food and Agriculture Sector Development Policy (FASDEP) it is emphasised that "*Natural phenomena, especially floods and drought, regularly result in disasters that cause severe food insecurity, and disruption of livelihoods. These disasters disproportionately impact on enterprises of poor smallholders and increase their vulnerability to food insecurity*…" (FASDEP, 2007: 11). To address this challenge the government has outlined measures and actions that it intends to take to develop climate-resilient agriculture and food systems for all agro-ecological zones in the country. These are outlined in both the National Climate Change Policy (NCCP) and the National Climate-Smart Agriculture and Food Security Action Plan (CSA Action Plan).

Some of the proposed measures include:

- Preparing and enforcing spatial plans to address conflicts between peri-urban agriculture and human settlements.
- Improving efficiency of farming practices through secure land tenure, effective pricing policies and access to credit.
- Promoting appropriate technologies for small-scale irrigation, water re-use and water harvesting.
- Developing climate-resilient cropping and livestock systems as well as crop varieties and livestock breeds tolerant to flooding, drought and salinity.
- Design and implement programmes on fisheries management and disease control, which integrate climatic and hydrological parameters.

Most of the outlined measures in these policy documents are technocratic and do not address the underlying issues of inequalities that give rise to vulnerability to climate impacts in the

study communities. They do not address the social and power relations that influence access profiles and which contribute to vulnerability in most households. For other proposed measures see Appendix 1.

Narratives about climate policies delivering 'triple wins' were made evident during interviews with institutional actors. This narrative is also mentioned in policy documents like the NCCP and CSA Action Plan. The 'triple wins' narrative draws on the FAO definition of Climate-Smart Agriculture "*agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals"* (FAO, 2010). Although the 'triple wins' narrative is useful for achieving food security and climate change goals, respondents from NGOs argue that often one aspect gets a greater attention. It is within this framing that issues about reducing deforestation through agriculture expansion and soil carbon storage are often made as well as discussions on conservation and reforestation. In Ghana mitigation activities have often been favoured over adaptation in debates and funding (Sarpong and Anyidoho, 2012). Tompkins et al (2013) argue that the narrative of 'triple-wins' is often oversimplified and overlooks the fact that policies designed to create 'triple-wins' can generate positive and negative impacts simultaneously. Negative impacts could include increased emissions, reduced capacity to adapt, or an increase in poverty levels in some communities. Policies designed to create 'triple-wins' often do not consider the fact that proposed interventions may have a negative influence on social relations of power and lead to elite control. They also do not consider possible constraints looking at how unequal power relations could influence households' ability to take on likely benefits. It is important that policy makers assess the trade-offs associated with policies that focus on 'triple wins' before implementing them.

Urban - climate change debates on the other hand have been framed in terms of disaster risk reduction. In the Ghana Shared Growth and Development Agenda GSGDA and National Climate Change Policy (NCCP), climate change is considered to intensify the risk of climate-related disasters and leads to increased loss of lives, livelihoods and assets. This affects the rate of economic growth, social development and increases vulnerability of women, the aged, youth and children (GSGDA, 2010; NCCP, 2013). Disaster risk reduction strategies are therefore required to increase resilience and minimize the risk of exposure to future hazards.

In Ghana climate related disasters in urban communities occur largely because of the lack of adherence to building code regulations and the weak enforcement of planning laws by the relevant institutions (GSGDA, 2014: 97). Some disaster risk reduction strategies include the relocation of settlements and economic activities from climate-related disaster-prone areas, the demolition of illegal buildings and settlements, the construction of storm drainage systems and the provision of early warning systems. Slum dwellers view disaster risk reduction strategies as an effort by the government to forcefully evict them from their settlements. Households whose property are pulled down during demolition exercises are rendered homeless and forced to live with family and friends. As structures built on water ways are considered illegal, property owners do not receive any compensation from the government neither are they provided with alternative accommodation. The authorities however make efforts to serve notice prior to demolition exercises. NGOs / CSOs on the other hand perceive some of these strategies as a temporary solution to controlling floods as demolished structures are often rebuilt after a short time. Most governments are not keen to implement some of these strategies as they risk losing votes when they do so. To reduce the expansion of informal settlements, the government tends to adopt policies focusing on rural development. This approach is adopted to help reduce rural - urban migration, one of the key factors influencing the growth of such communities. As the movement of people cannot be restricted it is essential that as the population increases efforts should also be made to plan for affordable settlements for all groups of people in the society. The strategies adopted by government for disaster risk reduction do not address inequalities but rather reinforce existing power relationships.

Urban – climate change debates have also been framed to focus on environmental protection. Development and urban growth is considered to increase the demand for energy which results in an increase in Greenhouse Gas Emission (GHG). Minimising GHG is likely to contribute towards economic growth through the unearthing of new business opportunities and the provision of new jobs related to the application of modern technologies as well as ensuring environmental sustainability and reducing the negative impacts of climate change in the future. This framing which can be found in national policy documents was also reiterated during interviews with institutional actors. It has led to the promotion of conservation practices and efficient use of energy in urban communities. Some initiatives that have been implemented to minimise GHG and make households and communities more resilient to climate impacts

include the recycling of biodegradable waste, replacing analogue meters with pre-paid meters to conserve energy, promoting the adoption of energy efficient and cleaner cook-stoves and replacing incandescent bulbs with energy efficient Compact Fluorescent Lamps (CFLs). NGOs argue that as a country with low GHG emissions the focus should be more on meeting the current needs of the people. Resilience to climate impacts in this instance is being used to support capitalism. Often initiatives implemented within this context provide an opportunity for contracts to be awarded to the politically connected and national elites allowing them to further enrich themselves. Some community members complained about how their electricity bills have increased after analogue meters were replaced with pre-paid meters.

At the national level, the urban - climate change debate has also been linked to migration and poverty. Climate change is expected to exacerbate socio-economic drivers of migration with the potential to increase the volume of out-migration from rural to urban areas (NCCP, 2013: 109). Institutional actors interviewed agreed that rural-urban migration will lead to an increase in informal settlements and increased vulnerabilities of an already marginalised group. Migrant populations are often concentrated in areas that are highly exposed to flooding, with poor housing conditions and have limited access to basic public services. They are often low-skilled and tend to work in the informal sector with unstable and low income. These factors further increase their vulnerabilities to climatic impacts. Urban poverty reduction and improved service delivery are often proposed as solutions to address these problems and make households in informal settlements more resilient to climate impacts. The promise of efficient service delivery in informal settlements is often linked to the privatisation of public services. Resilience is conveniently being used as a tool to perpetuate neoliberal ideologies (Cretney, 2014; Hornborg, 2009; Nadasdy, 2007; Watts, 2015). In trying to increase the resilience of the urban poor to climate impacts the state withdraws from providing social services for its citizens and encourages the privatisation of public services, which often means an increase in the price that urban poor communities will have to pay for these services. The proposed solutions by governments do not address the social causes of vulnerability this further exacerbates spatial and social inequalities.

7.2.2 Institutional Perception of Adaptation in Local Communities

Institutional actors' perception about adaptation at the local level also influences proposed responses to addressing the climate change challenge. The institutional actors interviewed believe that local communities are aware of climate change and are taking initiatives by themselves to adapt to these changes although the pace of adaptation coupled with the magnitude of climate impacts is slow. They therefore need to be assisted to adapt more effectively. An official from GIZ remarked: *"The adaptation done in the communities is based on the level of understanding of the people and this is a limited level of understanding. People observe what is happening and they begin to think of what they can do…. but where I think capacity is needed, is to make them understand the phenomenon better and also to expose them to the wide range of possibilities of adaptation which exists"* (GIZ 21.05.15). There are indigenous knowledge and skills that local communities use in adapting to the impact of climate change however these have proven inadequate in recent years. There is the need to build on already existing knowledge and skills in order to strengthen the adaptive capacities of vulnerable groups and individuals.

With regards to the activities of farmers, institutional actors interviewed indicated that local communities are adapting to climate change however they need to modify their farming techniques to keep pace with climate accelerated changes. An institutional actor stated: "*There are things that the farmers are doing and there are variety of skills that they already have for adapting to climate change. However, it's at a slow pace, we need to build the capacity of the farmers to adopt new technologies"* (Care International 03.06.15). Most institutional actors support discussions to make the agriculture sector more climate resilient by employing modern technologies like improved seed varieties, irrigation techniques and weather index insurance. Some institutional actors also reported that although climate change contributes to low crop yields, some farmers use unsustainable farming practices which results in the depletion of soil fertility and low crop yields. They believe farmers must be trained to use more sustainable methods on their farms. One of the factors that influences the way farmers relate to their environment is their access to finance. Access to financial assets influences their ability to invest in innovative technologies such as fertilisers, improved seed varieties and mechanized

farming which can help to increase land productivity. They note that farmers' adaptive capacities can be improved when modern agricultural technologies are complemented with local knowledge systems. Most of the suggestions institutional actors make to help improve the adaptive capacities of farmers are technocratic and apolitical. They do not address the issues of inequalities, particularly inequalities in accessing land which is one of the biggest challenges of marginalized farmers in the study community. Also, the introduction of modern technologies such as improved seed varieties creates a market for suppliers who are often national elites. These group of people tend to make profits at the expense of poor marginalised farmers.

Most institutional actors stated that awareness creation and education is required for the urban poor to better adapt to climate change impacts particularly with regards to waste disposal. The way urban poor communities handle refuse is perceived as an attitudinal problem and education is likely to correct this problem. This argument was also reiterated by key informants (elected representatives) in the communities. A key informant stated: *"The issue about refuse disposal is more of an attitudinal problem, every electoral area here has received some dustbins. We registered and distributed dustbins to households. However, some people openly told us that they will not take it. Twice a week a truck comes around to collect the rubbish and they have to pay an amount of GHS 15.00 per month"* (Ashaiman, Key informant, 12.03.15). Again, the suggestions institutional actors make for improving the adaptive capacities of local communities are technocratic and apolitical, they do not address the issues of inequalities. Most households in the informal settlement earn very low incomes therefore paying GHS 15.00 per month for only waste disposal is considered a lot of money given that they have to pay for water as well as toilet facilities on a daily basis. Efforts must therefore be made to make these facilities more affordable to households in these communities so as to reduce existing inequalities.

Regarding fishers' institutional actors agreed that livelihood diversification particularly aquaculture is required to help fishers adapt more effectively to climate change impacts. Officials from the fisheries department claim that attempts to encourage fisher folk to diversify their livelihood activities is often challenging. A research officer explained the situation saying: *"The challenge we face with the fisher folks is an attitudinal one …. Even where we*

*suggest alternative sources of livelihoods for them we will really have to convince them to come along as they are culturally and emotionally tied to fishing. There will be the need for a lot of education and sensitisation to get them to appreciate any new thing. They prefer livelihoods that provide money quickly not something that they will have to cultivate." (*Marine Fisheries Research Division, Tema 27.05.15). This remark to a large extent shows a limited understanding of the adaptive capacity and constraints of fisher folks by some institutional actors. It does not consider the social and political constraints they face in pursuing their livelihoods. Results from the field study show that fishers in the community do not have very many alternatives to fishing because of their limited access to capital assets. The ability of fishers to engage in any proposed alternative livelihood such as aquaculture will depend largely on their asset base. Although aquaculture can ensure that fish is produced all year round, all year production of fish, there is a high initial investment cost. To start they would have to acquire land, purchase fingerlings, purchase feed which is often imported and they would also need cold stores to store the fish. Unless the unequal power relations in accessing capital assets is addressed, most of the fishers in this community are not likely to take on the suggestion of the institutional actors to engage in aquaculture.

7.3 Implementation of Climate Change Policies

This section discusses some issues concerning the implementation of climate policies in the country. The section examines funding sources and funding allocation for climate projects. It also examines the focus areas, the target groups, target sectors and beneficiaries of climate policies and interventions. Community members awareness / knowledge of climate interventions are also discussed in this section.

7.3.1 Funding Sources and Allocation

Interviews with institutional actors revealed that funding sources for climate change projects are highly dependent on external sources. Most climate change projects are funded by development partners and international organizations with some contribution from the government. An official from NADMO stated: *"Most of the funding for our projects comes from international development partners. We hardly get any money from the government for these activities. We write proposals, send them across and get interested partners to support*

*us. We do not have a budget for climate change, our organization falls under the Ministry of Interior, also under this Ministry is the fire service, the police ... We all have our budget coming from this Ministry. There is very little allocated to climate change if any. Currently it's non-existent. So, without funding from international agencies nothing can be done" (*NADMO 23.04.15). The government's support for climate change projects is often inadequate or minimal. A government official stated: *"Each year budgets are drawn for our projects however whatever comes in for it to be achieved is very negligible. What we rely on mostly is external funding. Some of our partners include UNDP, USAID, GIZ, the French government, EU they are the most reliable sources of funding. For instance, UNDP, GIZ, and the EU are funding the current Intended Nationally Determined contribution (INDC) we are working on. Locally or nationally there is very little contribution"* (EPA, 24.04.15).

Although the country has a national climate change policy some institutional actors are sceptical if the actions outlined in this document will be implemented. They stated that due to inadequate funding a lot of policies do not get implemented as planned. They are concerned that this could be the same case with the climate change policy. There is often a mismatch between policy commitments and the financial capacity to deliver. An institutional actor noted this challenge: *"... I think it has been a very long-standing issue where as a country we have things written on paper but do not translate it into action. There is the issue of capacity in a broad term. Resources to implement most of these ideas are often non-existent; this includes the financial capital. Having a nice strategy, nice document but inadequate funds will make implementation impossible. This appears to be a common problem which runs across"* (GIZ, 21.05.15). An official from an NGO also noted *"The policies will be very useful to the local communities if they are implemented. We have the adaptation policy however because of inadequate funding most of these policies may not be implemented"* (ABANTU for Development 22.05.15*).*

A study of climate change finance in Ghana by Asante et al., (2015) showed that climate change relevant expenditure is approximately 2% of government expenditure and 0.5% of the country's GDP. The total cost of implementation of all programmes in the NCCP is estimated at USD 9.3 billion for the period of 2014-2020. The policy documents available do not provide a funding strategy however an official from MESTI pointed out the likely sources of funding

He said: *"We are looking at three or four sources of funding to implement the climate change policy. These include the government, private investment, bilateral and multi-lateral donor funds. We also have the Green Climate Fund (GCF) and Global Environment Facility (GEF)"* (MESTI, 21.04.15). These funding strategies are not coordinated / stream-lined but rather ad hoc.

Institutional actors also noted that donors often influence the kind of projects that gets implemented. An institutional actor stated: *"Although the government is trying to respond to the needs of the country sometimes development partners come with conditions for us to meet…this sometimes influences the projects that are implemented"* (MOFA Crop Services, 26.05.15). Through the projects they choose to fund donor agencies often influence the government into focusing on mitigation activities and initiatives (Sarpong and Anyidoho, 2012). In such instances, the government might not be able to concentrate on what it considers a priority. The government's response to climate change has largely been driven by international discourse and institutions around climate change (Cameron, 2011; Sarpong and Anyidoho, 2012). NGOs / CSOs have often raised concerns about the country's focus on mitigation over adaptation. They claim that major projects implemented by the government to address climate change are often targeted at mitigation and do not address the pressing needs of the people. For instance in the NCCP, The Focus Area, Developing climate resilient agricultural and food systems is estimated at a cost of USD 950 million, representing 10% of the total budget for climate financing in the country whereas an amount of USD 1,325 million has been estimated for the Focus Area, Increasing carbon sinks (Asante et al., 2015).

At the national level budgetary estimates have been made for proposed policy strategies in the NCCP (2015-2020). Budgetary allocations gives an indication of what the government considers as priority in addresssing climate change challenges. The Disaster preparedness and response policy theme has the least amount of proposed funding under the NCCP. It has 4% of the total budget outlined to finance climate change (Asante et al., 2015). Under this policy theme a budget of USD 336 million has been allocated to the Focus Area Build climate resilient infrastructure and an amount of USD 50 million to the Focus Area Increase resilience of vulnerable communities to climate related risks. Also under the policy theme Equitable social development, an amount of USD 1,678 million has been allocated to the Focus Area, Minimise

impacts of climate change on access to water and sanitation (Asante et al., 2015). Also, out of the total budget of USD 950 million for The Focus Area Developing climate resilient agricultural and food systems, only USD 45 million has been allocated to support adaptation in the fisheries sub-sector whereas USD 500 million has been allocated for improved marketing systems. A report by Asante et al., (2015) show that the Ministries of Fisheries and Aquaculture Development (MOFAD) was one of the few ministries with no budget allocation for climate change related activities in 2014.

The cost of implementation of the NCCP for the period of 2014 -2020 is estimated at USD 9.3 billion (GHS 35 billion). Available documents do not show a funding strategy of how domestic and international resources will be mobilized to implement proposed activities in the NCCP neither do they show measures that will be undertaken to ensure accountability and transparency in the delivery of climate finance (Asante et al., 2015). Having a funding strategy is essential for identifying alternative ways of generating finance for a project. The absence of a funding strategy poses a challenge on the financial sustainability of a project and consequently the effectiveness of implementing it.

7.3.2 Implementing Climate Change Projects

At the community level most climate change projects are being implemented by international organisations and NGOs who are supported by donors and development partners. Government agencies implement projects with the help of international agencies. Their projects are often aimed at enhancing livelihoods. They also make efforts to incorporate gender perspectives in their projects so that the concerns of both men and women could be effectively addressed. There are a number of ongoing projects that are climate related but are often not termed as climate adaptation projects. Institutional actors stated that sometimes projects which were not conceived to address climate change have included a climate change component along the way as this is often a prerequisite to secure funding. An institutional actor reported: *"These days in order to have access to funding most projects that are implemented are said to be responding to climate change. Organizations are using the same old methods… they just add the tag climate change to a project and expect to have different results… officials in these organisations must be trained to build their capacity in implementing climate change projects"*

(Care International 03.06.15). Including a climate change component to a project does not necessarily mean the project will address climate change issues appropriately.

Most of the projects being implemented to address climate change are fragmented and not well coordinated. This results in overlaps and the duplication of activities (Wurtenberger et al., 2011). Local institutions often do not keep records of ongoing projects in the communities so they are unable to advise organisations intending to implement projects. Outside agencies also do not involve local institutions in the implementation process so they cannot continue to monitor projects long after they are completed to ensure sustainability. An institutional actor explained this situation: *"…There is currently no coordination between the different groups working on climate change, various organisations are doing their own things, as soon as a project is over everyone is gone. Most of the projects being implemented are not sustainable. We need to merge our efforts to propel us forward"* (GMet, 20.04.15).

Interviews with institutional actors revealed that the implementation of projects by development partners is often guided by the government. An official from GIZ explained: *"Development partners assist the government to do what it is supposed to do…. Development partners are often limited by a number of factors like the budget... so their projects or interventions operate at a limited scale. The Government usually identifies the areas where there are gaps and advises development partners as to where interventions would be required"* (GIZ, 21.05.15). The process of identifying areas that require intervention is often fraught with politics. This usually leads to disproportionate distribution of projects as ruling parties tend to implement projects in political strongholds. In this way communities that genuinely require particular assistance are neglected and this negatively affects their adaptive capacity.

Local knowledge is often incorporated at the implementation stage to increase the success rate of projects. This was however not evident in the study communities. Institutional actors noted that at the policy level it's the broad intervention areas that are looked at. As there are unique needs and responses required in each community the incorporation of local knowledge often takes place at the implementation stage of a project or programme. An official from MOFA crop services said: "*We deliberately incorporate local knowledge into the projects we implement. …at each regional and community level, there are issues that need to be addressed and the people living in their community have a better knowledge of their community than*

anyone coming from outside so we need to listen to them and build on what they share" (MOFA Crop Services 26.05.15). Although the incorporation of local knowledge is useful for enhancing the rate of success of a project this was not evident in the field site. Interviews with some community members showed that they did not feel their knowledge was being brought into the implementation of projects. A female respondent in the fishing community explained: "*An NGO came here to build solar stoves for us. They wanted us to use the stoves for smoking fish but they didn't consult us before designing it. When we put fish in it takes a very long time before it cooks and it does not look as good as fish smoked with firewood. They claim the one who fixed it made a little mistake and they hope to rectify it for us. This project has not brought about any change in our lives because we don't use the stoves*" (Tema, 06.02.15 Female fishmonger).

Concerning target groups and beneficiaries of climate interventions, the study showed that more emphasis has been placed on addressing the challenges of food crop farmers than fishers. An official from a local NGO pointed out *"I think in Ghana more emphasis has been placed on crop and animal farmers as compared to fisher folk. When they talk about the coast with relation to climate change in Ghana it is more about sea level rise and the erosion of beaches but not necessarily the work of the fishermen"* (Abibimman Foundation *7.05.15).* Both institutional actors and the farmers interviewed acknowledged that with regards to agriculture a lot more projects tend to be implemented in the Northern part of the country than the South. An official from an NGO stated: "*Most of the projects implemented with a climate change component are often implemented in the Northern part of the country… It is believed that there is high poverty level in the North… they are thought to be experiencing climate change the more... There are even more NGOs in the North"* (ABANTU for Development 22.05.15*).* The Upper East, Upper West and the Northern regions have been identified as some of the poorest in the country. Over the years it has been the priority of most governments to decrease inequality gaps between the North and South. The North - South divide often arises as a major issue during elections with political parties outlining ways in which they have or intend to bridge inequality gaps. Political parties have electoral incentives to ensure that projects are implemented in the North as it could also lead to voting gains for them (Asante and Gyimah-Boadi, 2004). Although it is generally agreed that poverty levels are higher in the North than the South of Ghana and this justifies the predominance of projects to address climate change

there, the failure to address climate change impacts as well as farmers' access to productive assets like land and water in the South could have implications for reversing poverty reduction gains in the south. By placing greater emphasis on some particular regions, vulnerable groups in other regions are often neglected. In implementing policies efforts should be made to reach all vulnerable groups.

Respondents indicated that most projects implemented to address climate change often address droughts more than floods. An official from an NGO remarked *"... most people see climate change as only when there is a drought and that is when they feel providing adaptive strategies will help the people more"* (ABANTU for Development 22.05.15*).* Unlike droughts, floods in the West African region have often not featured in scientific and policy debates. Tschakert et al., (2010) argue that this bias is related to the desertification narrative that was instigated by the United Nations Conference on Desertification (UNCOD) in 1977 following the 1972–1974 Sahelian droughts and famine. Ever since then, this narrative has lingered and has resulted in insufficient research on floods in the region. This environmental narrative often influences where projects are implemented. An official from NADMO explained the choice for the location of a project they are currently implementing: *"Our project is currently running in the Upper East region… we decided to start there because the place is basically becoming a desert. In the North, the impact of climate change is much more visible like the degradation of forests so we see the need to educate and plant more trees in these areas …"* (NADMO, 23.04.15). The desertification thesis has been contested by several authors. It has been criticized for drawing conclusions from insufficient or inaccurate data of colonial era representations about the ecology of the African Region (Leach and Fairhead, 2000). It has also been criticized for relying on Neo - Malthusian assumptions which only focus on increasing population as the cause of environmental degradation consequently ignoring the role of other factors such as policies and access to resources (Tiffen et al., 1994). Recent IPCC reports show that the West Africa region is also vulnerable to floods. The 2007 and 2013 IPCC reports suggest an increase in the number of extreme rainfall days over West Africa and the Sahel. The number of extremely wet seasons is projected to increase by 20% over the next decades (IPCC, 2007, 2014b). An increase in extreme rainfall days and wet seasons will increase the incidence of floods. Equal attention must therefore be given to both floods and droughts in the country.

Institutional actors and respondents from the community stated that compared to urban communities most projects aimed at addressing climate change tend to be implemented in the rural communities. Like many developing countries poverty in Ghana is considered to be more widespread in rural than urban areas consequently the government makes considerable efforts to bridge the rural - urban poverty gap. Although there are significant pockets of poverty in urban areas this is often overlooked. In Ghana, rural dwellers are net food producers, climate change often impacts negatively on their production levels. As the government is interested in maintaining food security most of its projects are targeted at improving rural food production. Cohen and Garret (2010) however argue that as net food producers rural dwellers can draw on their own crops or livestock to buffer shocks whereas few urban dwellers have these options. In Ghana, about 92% of the urban poor's expenditure is on food purchases (Cohen and Garrett, 2010). Climate change projects implemented must not only increase food production in rural communities but must also focus on making food accessible and affordable for the urban poor.

At the local level, almost all respondents interviewed claimed they were not aware of any government policies, interventions or ongoing programmes to address climate related hazards like floods and droughts in their communities. However, they stated that it is mostly after disasters like floods that they get any form of assistance in the community and there again households that have close links with those in authority benefitted more from such assistance. They stated that they sometimes hear about imminent projects but have not witnessed their implementation or benefited from them. A male respondent from the informal community stated: *"I sometimes hear on the radio that the government wants to implement some projects here but truthfully I have not benefited from any of these projects. The day I benefit from any of these programmes I will believe they are real"* (Ashaiman, Male respondent, 08.03.15). A farmer also reported: *"About 3 years ago I heard that farmers were being given onion seeds to grow but we never had access to it here. We tried to enquire about this but they asked us to come back on several occasions, at a point we stopped asking…."* (Kpone, Male Farmer, 23.03.15). As a result of their inability to access government interventions some respondents from the farming community believe that the government is more interested in assisting large scale commercial farmers than small scale farmers. A farmer stated: *"I have heard that the government has plans to help farmers but I think they are thinking more about the large-scale farmers as for small scale farmers like us I don't think we are included"* (Kpone, Male Farmer,

23.03.15). There is sometimes discrimination in the implementation of projects based on political party affiliations, therefore communities or households who do not belong to particular parties are denied access to such interventions.

The lack of knowledge about government interventions could be attributed largely to the lack of transparency in project implementation. Some institutional actors pointed out that local communities are not likely to know about a policy/government initiative unless they have evidence through implementation. As most of the community members are not directly engaged in the decision-making process, it is only through implementation that they find out about the government's agenda. Once there is no implementation the relevance of a policy document is lost and communities are not likely to know about what is going on at the formal level. An institutional actor also indicated that the lack of knowledge about what is happening at the formal level could be attributed to a communication gap between local communities and their representatives at stakeholder meetings. Local leaders representing their communities at the formal level do not communicate efficiently with their community members. Most often projects target particular groups of people therefore community members who do not benefit directly from these projects are not likely to be aware of them.

This chapter discussed how national level policies / interventions interact with vulnerability and adaptation at the local level. It also analysed the ways in which adaptation policies address the structural / root causes of vulnerability. The narratives that have been used in framing the climate change problem, and institutional actors' perception about adaptation at the local level, have influenced proposed responses to addressing the climate change challenge. Most of these responses have been technocratic and apolitical. They have not addressed the root causes of vulnerability. The next chapter which is the concluding chapter will discuss the main research findings and the implications of these findings. It will make some recommendations for policy makers and will also make some recommendations for future research.

CHAPTER 8

8.0 DISCUSSION AND CONCLUSION

8.1 Introduction

The main purpose of this thesis is to examine the relationship between climate impacts and existing vulnerabilities amongst food crop farmers, fishers and slum dwellers in three coastal communities in Ghana. The study looks specifically at how social relations of power affects access to resources and decision making and their implications for vulnerability and adaptive capacity under changing climatic conditions. The study also examines the role that policy plays in addressing vulnerabilities to climate impacts in the study communities.

The study contributes to the ongoing debate on the politics of adaptation, the need for adaptation policies to address the underlying causes of vulnerability specifically the social relations of power that produce inequalities. Using a perspective that is important but often overlooked in the study of vulnerability and adaptation to climate impacts in Ghana, the thesis examined the root causes (structural and relational drivers) of vulnerability and the extent to which adaptation policies address these root causes. The study also makes a theoretical contribution by modifying the Pressure and Release Model (PAR) by Wisner et al., (2004) to show the causal relations between climate change and socio-politico-economic processes. The PAR model is modified to capture how the root causes of vulnerability i.e. the social, political and economic processes which drive vulnerability are fundamentally implicated in producing global environmental change and how the root causes of vulnerability are themselves affected by global climate change.

The study was conducted in three communities in the Greater Accra region of Ghana. A farming community (Kpone), a fishing community (Tema) and an informal community (Ashaiman) were selected for the study. These communities were selected because of their location in the coastal savannah an ecological zone that is highly exposed to climate impacts. This zone is characterized by a dry climate with increasing rainfall variability and hotter temperatures. The zone is also prone to flooding and sea erosion. It was also selected because of

the variation of livelihood activities particularly livelihood groups that have been identified in national climate policy documents as vulnerable to climate impacts e.g. fishers and farmers. The informal community was selected to provide information about the impact of climate change on the urban poor. The communities were also selected because of the high incidence of poverty, increased risk of diseases, increasing environmental problems and increasing land tenure issues. A qualitative mixed method approach consisting of participatory tools, focus group discussions and semi-structured interviews at the household, community and institutional level was used in the study

The study sought to answer the following questions:

- How does the interplay between climate impacts and existing vulnerabilities influence vulnerability levels and adaptive capacities of coastal communities in Ghana?
- How do social relations of power affect access to resources and decision making and what are their implications for vulnerability and adaptive capacity of coastal dwellers under changing climatic conditions?
- In which ways do government interventions on climate change and broader policies or interventions interact with vulnerability and adaptation in coastal communities?

This chapter consists of five sections, the first being the introduction. The second discusses the main research findings. The third section discusses the implications of the research findings and makes some recommendations for policy makers. The concluding section makes some recommendations for future research.

8.2 Main Research Findings

Findings from the study show that:

1. Existing vulnerabilities created from development trajectories pursued in the past interact with climatic impacts to further exacerbate vulnerabilities and decrease adaptive capacities of households in the study communities.
2. Unequal social relations of power drive differential vulnerability patterns among households in the study communities.

3. The access profile of a household influences the strategies used in responding to climatic impacts. A household decision to use a particular strategy over another depends on their access to particular assets.
4. Climate change related adaptation policies by government and other actors do not adequately address the underlying causes of vulnerability consequently perpetuating vulnerabilities and reducing the adaptive capacities of households in the study communities.

Each of these findings will be discussed under the following headings in the sub-sections below. Interaction of existing vulnerabilities with climatic impacts (Section 8.2.1), Unequal social relations of power and differential vulnerability (Section 8.2.2), The influence of access profile on adaptation and coping strategies (Section 8.2.3) and Reproducing vulnerability through adaptation policies (Section 8.2.4).

8.2.1 Interaction of Existing Vulnerabilities with Climatic Impacts

In relation to the first finding, data presented in Section 5.2 indicates that neoliberal structural adjustment policies, the urbanisation process, the methods of managing urban land and marine fish resources in the past have created vulnerabilities which interact with climatic impacts to further exacerbate vulnerabilities and decrease adaptive capacities of households in the study communities.

The implementation of neoliberal policies like trade liberalization, laying off public sector workers, reduction of government spending through cuts in social services like health education and housing increased vulnerabilities of local communities. The liberalisation of local markets using the removal of import taxes for instance exposed local producers particularly farmers and fishers to unequal competition from imported goods consequently, undermining their livelihoods and increasing inequalities in the society. Also, the phasing out of input subsidies and the privatisation of the sale of inputs resulted in an increase in input prices which led to a decline in productivity of small scale farmers and artisanal fishers. As a result of the liberalization of the housing market which led to an increase in rents, low-income earners were forced to live in substandard housing and in unsafe locations which have left them

more exposed to adverse climatic impacts. The removal of subsidies on social services like health and education led to an increase in the cost of these services and a decline in real wages worsening the plight of the poor and social groups such as women. Government's entrenchment policy also led to an increase in urban unemployment. Low incomes coupled with adverse climatic impacts further increased their vulnerabilities.

The perpetuation or continuation of the social stratification system introduced by the colonial administrators and the lack of planning and building regulation resulted in residential segregation and promoted slum and unplanned settlements in urban communities (Aboagye, 2012: 161). Unplanned settlements are often located in unsafe places such as flood prone areas and they lack basic social amenities such as water, sanitation, waste disposal and drainage facilities. Settlers in unplanned communities are often victims of forced eviction and are more exposed to adverse climatic impacts.

The increasing demand for land for various urban uses is leading to the commodification and commercialization of land by local elites making it difficult for farmers to have access to land for farming. By selling farmlands, the livelihood opportunities of local elites like traditional authorities who are custodians of the land are enabled whilst that of poor local farmers are foreclosed. This leads to a widening of social inequalities and increases farmers vulnerabilities to climatic impacts.

Modernization of the fishing sector by the government has influenced the vulnerability levels of fishing communities in the country. For instance, the introduction of the outboard motor increased its use and the exploitation of marine fish resources. The government's role to maintain, fishing efforts by giving subsidies supports unsustainable usage of fisheries resources which leads to the depletion of fish stocks. In addition, premix fuel meant for the fishers has sometimes been diverted onto the black market, leaving fishers, particularly the marginalised unable to access premix when necessary (Tanner et al., 2014). Also, the increasing competition from foreign vessels, the failure of the government to control access to the fisheries resources has led to declining profitability in the fisheries sector. Overfishing and the increasing competition from foreign vessels increases fishers' vulnerability and makes them less resilient to climatic impacts.

8.2.2 Unequal Social Relations of Power and Differential Vulnerability

With respect to the second finding, data presented in section 6.1 indicates that vulnerability to the impacts associated with climate variability and change in the study community is socially differentiated. Poor and very poor households are more vulnerable to climate impacts than better-off households in the study communities. Social relations of power influences access to the capital assets (financial, physical, social, human and natural capital) upon which livelihoods are built. The unequal social relations in accessing these assets brings about entrenched inequalities and dependencies in the face of climatic changes.

Financial capital: To engage in their various ventures poor and very poor households in the study communities depend on commercial and local money lenders for financial assistance. They however face challenges when using these channels. For instance, commercial money lenders often charge high interest rates, give short periods for loan repayment, demand documents and collateral before providing credit. These serve as barriers for the poor in accessing finance. Money lenders like Microfinance institutions charge high interest rates and give short periods for loan repayment. It is usually impossible for local enterprises to have a high turnover to meet repayment schedules. They also use coercion and other shaming practises to ensure loan repayment. The rolling over of ongoing debts creates an ongoing power relationship between debtors and creditors. Poor and very poor households are often unable to fully pay back their debts on time. As most fishers and farmers borrow money from market traders they bear a greater risk. Even when there is a crop failure due to climate variability or if there is low fish catch the farmers and fishers are still obliged to pay the debt. This gives market traders an advantage over them.

Human Capital: Education leads to differing vulnerabilities. Better off households with higher levels of education engage in wage earning activities which provides a more regular source of income that helps them to respond more effectively to climate impacts as compared with poor and poorer households who have lower education levels and tend to work on jobs that are irregular, low paying and often in unsafe environments.

The health of households in the study communities are affected by the high incidence of diseases like malaria and diarrhoea . The limited access to domestic toilet facilities, and the

few designated places to dump refuse leads to poor sanitary conditions in these communities. Poor and very poor households tend to spend a lot more money to access toilet and water facilities as they do not have these facilities in their homes.They are also more exposed to diseases and infections as a result of the absence of these facilities in their homes. Better-off families make money by providing these services at a price to poorer households that do not have it. The National Health Insurance Scheme implemented to provide access to health care does not seem to be working efficiently. As a result of the inefficiency of the health insurance system poor and very poor households cannot easily access health care. Better-off households who can afford it prefer to pay to use the private health facilities.

Farmers consider labour as one of the most expensive farm inputs. Poor and very poor farmers particularly female farmers who cannot afford to hire labour farm smaller plots. Most farm households can no longer rely on family labour as the youth consider farming an unprofitable venture. Climate impacts and the difficulties in obtaining land for farming have made what was previously a relatively reliable way of making a living become less so.

Natural Capital: The sale of farm lands by local elites has led to a decrease in the plot of lands that farmers in the community now own**.** It has also left some farmers landless. Better-off households tend to have more plots of land than the poor and very poor. The unequal power relations that exist between men and women is also seen in the location of farms. Male farmers tend to be less vulnerable to climate impacts as compared to female farmers. Unlike the women most of the male farmers are situated near waterways and streams, which allows them to practise irrigation farming so they can farm even in the dry season. Access to productive resources like land are often mediated by men (chiefs, family heads, husbands, fathers and brothers). As a result of the traditional patriarchal system, male farmers are often allocated larger plots of land and productive land near water resources. Traditionally, the responsibilities of men in the household are considered to be greater than women. Men are considered to be the main providers of the family, consequently they are given preferential access to land resources so that they can have the necessary material resources to meet the needs of the family.

Artisanal fishers also suffer from unequal power relations. Foreign Distant Water Fleets (DWFs) have created competition for local fishers. They fish in zones allocated to artisanal fishers thereby reducing their fish catch. They also use illegal methods such as pair and bottom

trawling in fishing which leads to the over exploitation of fish resources. However, because of their close relationship with officials within the government usually little or no action is taken against their illegal fishing practices as compared with artisanal fishers. The unfair competition from DWFs has adverse effects on fish catch and the total earnings of fishers. Low incomes from fish catch reduces the capacity of fishers to adapt effectively to climatic impacts.

Physical capital: The unequal relations between boat owners and fishers, input suppliers and farmers and fishers, farmers and market traders as well as fishmongers and fish traders leads to differential vulnerabilities. Farmers and fishers are dependent on suppliers for the inputs required to earn a livelihood. Artificial shortages created by input suppliers has negative effects on their production. For instance, the diversion of subsidised premix fuel from the main target group onto the black-market leaves fishers particularly the marginalised unable to access premix when necessary. These artificial shortages lead to an increase in prices and their cost of production. Inequality is also seen when market traders take advantage of farmers and fishers and compel them to sell their produce at prices lower than the market value because of their inability to store fish or harvested produce after a bumper harvest. This has adverse effects on their income and reduces their adaptive capacities.

Social networks: The limited participation of poor and very poor households in social gatherings reduces their access to information which could help them improve the livelihood activities they are engaged in. As a result, they are more likely to be adversely affected by climate change impacts. Better-off households with wide social networks and political connections tend to recover more quickly from disasters as compared to poor and very poor households. The opinions of the poor and very poor are often not sought when making decisions that directly affect their vulnerability and adaptive capacities. They are represented by local representatives at stakeholder meetings these representatives often do not communicate proceedings or decisions taken at such meetings to the people they represent.

8.2.3 The Influence of Access Profile on Adaptation and Coping Strategies

In relation to the third finding, data in section 6.2 shows that the access profile of a household influences the strategies used in responding to climatic impacts. The access profile of a household influences the capacity of the household to adapt to / cope with shocks and stress.

A household's decision to use a particular strategy over another depends on their access to particular assets.

As compared to poorer households, better off households use more cost-intensive methods to respond to climatic events. Poorer households respond to floods by clearing and dredging drainage facilities before the onset of rains, they also make temporary channels to facilitate the flow of water. Better- off households on the other hand construct concrete embankments / walls to prevent flood waters from entering their homes and shops. They also raise the floor foundation of concrete buildings. Better - off households with wide social networks relocate temporarily to live with family and friends.

In anticipation of periods of water shortages better-off households buy larger and more durable storage tanks so they can store water for a longer period. They can also afford to purchase water from private water tankers. Poorer households on the other hand go longer distances to fetch water during such times. The burden of providing water for the family falls largely on girls and women in these households. Also during periods of drought better-off household's draw on food they have stored over time or on their social networks for assitance, whereas poorer households purchase less food, cut down on the number of meals per day and buy food from street vendors. Unlike the poor farmers, better-off farmers who are mostly male farmers and whose farms are usually close to water sources, irrigate their farms as they can afford to buy water pumps, pipelines and fuel for irrigation. They also buy and grow drought resistant varieties against drought.

The main livelihood strategies that households in the study community employ to adapt to climatic impacts in the communities include diversifying their livelihoods and migration. These strategies are used in addressing the seasonality of livelihoods as a result of climate-related shocks and stresses. As migration in fishing requires the use of productive assets which are cost intensive and migration in farming requires access to social networks at migrant destination they are used more widely by better-off households than poor and very poor households. Women are often unable to migrate because of child care and household chores. Livelihood diversification, particularly petty trading is used by most households. Irrespective of the season or time of the year it can provide some income and food for the household.

Livelihood diversification also enables households to step up their activities. The aspirations of most households in the study communities to step up and/or step out in their livelihood activities is often hindered by their limited access to productive assets. The ability of a household to diversify livelihood sources is dependent on the assets available to them. As compared to poorer households, better-off households who have access to a wide range of assets particularly productive assets can combine these assets to widen their income earning portfolio to cover shocks or stresses.

8.2.4 Reproducing Vulnerability through Adaptation Policies

With regards to the fourth finding, data in chapter seven show that climate change related adaptation policies do not adequately address the underlying causes of vulnerability consequently perpetuating vulnerabilities and reducing the adaptive capacities of households in the study communities. The National Land Policy which is being implemented through the Land Policy Project funded by the World Bank does not address the underlying causes of vulnerability. In this policy, access to land is supposed to be secured through land registration / land titling. As registration of the land involves high costs it leads to the exclusion of the poor. The policy does not address discriminatory practices affecting access to land by vulnerable groups. The inability of land policies to explicitly define the role of chiefs in the administration of land gives them an unfair advantage over their subjects. There are no regulations regarding how proceeds from the sale of land by chiefs should be allocated. The sale of agricultural lands for urban residential plots and construction of industries leaves poor marginalised farmers with little or no land to pursue their livelihood activities.

Urban planning also focuses more on physical beautification rather than addressing poverty and inequality. Urban planning which follows colonial spatial plans does not accommodate poor and informal communities. Attempts at planning have often been top down and this further marginalises the poor. For instance, the process for applying for building permit before constructing a building is a long and expensive process which causes low-income households to relocate to cheaper land on the urban peripheries. Eviction exercises and the demolition of structures are often justified by the aim to achieve spatial order although profit - making agenda may be the motive for implementing these exercises. Ruling parties may also make political gains through eviction exercises. The inability of authorities to regulate and enforce building

codes leads to the construction of buildings on waterways and in unsafe places. Also, the inability of the planning system to support the activities of poor urban populations working in the informal sector also contributes to further poverty and marginalisation of the urban poor. Planned urban projects provide limited places or space for their activities.

In the fisheries sector, the need to stay in power leads to the implementation of projects and programmes that are not environmentally sustainable. Projects or programmes implemented to improve the capacity of fishers are often used by politicians to win elections. For instance, the subsidised pre-mix fuel program has often been used as a campaign promise to garner votes. Although considered a perverse incentive that leads to the overexploitation of fishing stocks it has been maintained by various governments. The long coast line leads to high costs of surveillance. Also, limited personnel and logistics often serves as a deterrent to Monitoring, Control and Surveillance activities (MCS) by the Fisheries Enforcement Unit (FEU). To avoid losing votes authorities are often not stringent in enforcing laws. When fishers lose their livelihoods because of the enforcement of laws this could affect voting patterns, and could lead to a loss of votes as fishers are a large population. As most top officials are shareholders or own DWFs they tend to constrain the efforts of the FEU. Some are alleged to connive with foreign DWFs to break the laws. The implementation of the Community-Based Fisheries Management Committees (CBFMCs) also brought about unequal power relationships between fishers and influential committee members. Members on the committee were given authority to punish fishers who practised illegal fishing. Committee members also took advantage of this position and used it for rent - seeking activities particularly when they were vying for positions as local leaders. They pardoned offenders supporting them whilst punishing offenders who did not support them.

Institutional actors' perception about the climate change problem also causes them to propose technocratic solutions to address the climate change challenge. At the formal level the climate change-agriculture (fishing and farming) narratives are centred on livelihood and food security. In the FASDEP, floods and drought are considered to result in disasters that cause severe food insecurity, and disruption of livelihoods. These disasters disproportionately impact on enterprises of poor smallholders and increase their vulnerability to food insecurity. To address this challenge the government has outlined measures and actions that it intends to take to

develop climate-resilient agriculture and food systems for all agro-ecological zones in the country. One of these measures include preparing and enforcing spatial plans to address conflicts between peri-urban agriculture and human settlements. Most of the outlined measures in these policy documents are technocratic and do not address the underlying issues of inequalities that give rise to vulnerability to climate impacts in the study communities. They do not address the social and power relations that influence access profiles and which contribute to vulnerability in most households. Another prevalent climate change-agriculture narrative is centered on climate policies delivering 'triple wins'. Climate policies are expected to address adaptation, mitigation and social development simultaneously. However in most instances mitigation activities have often been favoured over adaptation in debates and funding (Sarpong and Anyidoho, 2012). Afforestation, reforestation and conservation projects have been promoted within this framing. Policies designed to create 'triple-wins' often do not consider the fact that proposed interventions may have a negative influence on social relations of power and lead to elite control. They also do not consider possible constraints looking at how unequal power relations could influence households' ability to take on likely benefits.

Urban - climate change debates on the other hand have been framed in terms of disaster risk reduction. Disaster risk reduction strategies are therefore required to increase resilience and minimize the risk of exposure to future hazards. Some disaster risk reduction strategies include the relocation of settlements and economic activities from climate-related disaster-prone areas and the demolition of illegal buildings and settlements. Most of the strategies adopted by government for disaster risk reduction often do not address inequalities but rather reinforce existing power relationships. Urban – climate change debates have also been framed to focus on environmental protection. Development and urban growth is considered to increase the demand for energy which results in an increase in Greenhouse Gas Emission (GHG). The government has therefore implemented some initiatives to minimise GHG and make households and communities more resilient to climate impacts. These include the recycling of biodegradable waste, replacing analogue meters with pre-paid meters to conserve energy, promoting the adoption of energy efficient and cleaner cook-stoves and replacing incandescent bulbs with energy efficient Compact Fluorescent Lamps (CFLs). Resilience to climate impacts in this instance is being used to support capitalism. It provides business opportunities for the politically connected and national elites allowing them to further enrich themselves.

At the national level, the urban - climate change debate has also been linked to migration and poverty. Climate change is expected to exacerbate socio-economic drivers of migration with the potential to increase the volume of out-migration from rural to urban areas (NCCP, 2013: 109). Urban poverty reduction and improved service delivery are often proposed as solutions to address these problems and make households in informal settlements more resilient to climate impacts. The promise of efficient service delivery in informal settlements is often linked to the privatisation of public services. Resilience is conveniently being used as a tool to perpetuate neoliberal ideologies (Cretney, 2014; Hornborg, 2009; Nadasdy, 2007; Watts, 2015). In trying to increase the resilience of the urban poor to climate impacts the state withdraws from providing social services for its citizens and encourages the privatisation of public services, which often means an increase in the price that urban poor communities will have to pay for these services. The proposed solutions by governments do not address the social causes of vulnerability this further exacerbates spatial and social inequalities.

Also, institutional actors' perception about adaptation in local communities causes them to propose technocratic solutions to address the challenges these communities face. Institutional actors indicated that local communities are aware of climate change and have indigenous knowledge and skills they use in adapting to these impacts. However their adaptation strategies have proven inadequate in recent years because of the increased rate and magnitude of climate impacts. They therefore require support to strengthen their adaptive capacities. Institutional actors also believe that some actions of local communities have exacerbated climatic impacts. For instance, the improper disposal of waste in the informal community leads to choked drains and increases the incidence of floods, unsustainable farming practices results in the depletion of soil fertility and low crop yields and the use of illegal fishing methods have led to a decline in fish catch. In all cases institutional actors propose awareness creation and education as actions to help address these challenges. They suggest that training slum dwellers to dispose waste properly as well as providing them with infrastructure and affordable basic services would help them adapt more effectively to climate change impacts. Farmers on the other hand should be trained to use more sustainable methods on their farms, they should also modify their farming techniques to keep pace with climate accelerated changes. The Fisher folk should also be educated about the dangers of illegal fishing and those involved in illegal, unreported and unregulated (IUU) fishing should be arrested and sanctioned. Most of the solutions they

propose do not address the underlying causes of vulnerability that is the unequal power relations that cause inequalities in the communities.

8.3 Policy Implications

Findings from the study show that small scale farmers and fishers face difficulties in accessing finance to expand their business ventures. Financial institutions are reluctant in offering credit to these livelihood groups because of the volatile nature of their work. In addition, they lack what most financial institutions will consider suitable as collateral like land deed and farm machinery. The sources of finance for fishers and farmers have often not been targeted to meet their needs. Financial institutions often do not take into account the sensitivity of the livelihoods of fishers and farmers to climate variability and change when providing them with credit. The Agriculture Development Bank which has the primary function of providing finance to assist small scale farmers and fishers is no longer doing so. The study recommends that as farming and fishing activities are prone to the vagaries of the weather the government and financial institutions should take the necessary steps to tailor financial products to meet the needs of farmers and fishers. Efforts could also be made to provide credit facilities at reduced interest rates. Financial institutions often cannot provide credit at reduced interest rates to these livelihood groups because of the high transaction cost involved in reaching out to them. These costs include the cost of appraisal of borrowers , the costs of loan monitoring, collection and recovery. The ability of Financial institutions to reduce these transaction costs could help them reduce the costs of interests rates. Creditors could also be given longer repayment terms so that they can have a high turnover to meet repayment schedules. The government could restructure the Agriculture Development Bank to perform its primary function of assisting farmers and fisher folks. This could be achieved by creating a microbanking or microfinancing division within the bank. This division could be mandated to offer small and micro loans at affordable interest rates as well as mobilizing microsavings for farmers and fishers.

Evidence from the study shows that the poor and very poor are often excluded from the decision-making process. Their opinions are often not sought on decisions which impinge directly on their vulnerability and adaptive capacities. In addition, those who represent them at local and national level stake holder workshops and meetings do not communicate

proceedings or decisions taken at such meetings to them. This communication gap limits the ability of the poor and marginalised to contribute in the decision-making process consequently their perspectives are not likely to be considered in final decisions. This study recommends that efforts must be made by policy makers to seek the views of the poor and very poor at the initial stages of the policy making process so as to ensure that policy decisions are relevant and reflect their needs. Information about the opportunities to influence decisions as well as information on decisions taken during national level stake holder workshops and meetings should be communicated through channels used by the poor like the local radio programmes at durbars and within their religious institutions or social groups. The dissemination of information should not be left entirely to local representatives or institutions. National and local government officials responsible for managing participation in decision making are often not held accountable to engage the poor and to address their concerns. Participation of the poor can be enhanced by deliberately inviting the poor for meetings, creating an environment in which they are comfortable to participate and breaking down technical information to their understanding by using their native language.

Findings from the study show that the difficulty in accessing farmlands is leading to a decline in the productivity of farmers. Current land policies do not address the inequalities associated with land acquisition. The focus has been on land registration / titling which has made land more accessible to the better-off than the poor. The study recommends that the government should address the inequalities in accessing land in order to increase farmers' access to land. To address the issues of elite capture of land, the role of chiefs as custodians of land could be clearly defined in both statutory and customary law. They should also be provided with guidelines for consulting with communities and individuals before selling / leasing land as well as guidelines on how those that have lost their land would be compensated. Efforts could also be made to deliberately conserve some land for farming. There is also the need for community based accountability mechanisms to be put in place so local authorities can be held accountable. There are currently minimal local accountability mechanisms. The council of elders who are supposed to represent the views of the community and who must hold the chiefs accountable have often been co-opted by chiefs and tend to share the benefits from the sale of land with them. Consequently, they cannot hold the chiefs accountable as they should. Members of the council of elders are usually selected from influential and royal families. In

order to ensure transparency and accountability there is the need to broaden the membership of land allocation committees in various communities to include community members from various social classes and not only influential members of the community. Members of these committees could be trained and equipped to work together with traditional authorities to facilitate transparency and ensure that community held land is managed in the interest of the community.

Results from the study show that Illegal, Unregulated , Unreported (IUU) fishing coupled with climatic impacts reduces fish stocks and adversely affects the livelihood of fishers. Governments still maintain incentives like the subsidy on premix fuel to gain votes in election even though they are not very beneficial for the sustainability of the fisheries sector. The FEU also lacks resources, personnel, and logistics to monitor and enforce regulations in the fisheries sector. Fishing agreements with foreign DWFs are often made with political elites and government officials. The views of the poor who are dependent on the fisheries sector for food and employment and whose activities are directly affected by these agreements are not taken into consideration during the decision-making process. Some government officials allegedly benefit from these agreements and would therefore not be willing to make the details of some of these agreements public. They may also want to avoid any confrontation with stakeholders who are more likely to be affected directly by foreign fishing vessels practising IUU fishing**.** The study recommends the reduction or phasing out of capacity - enhancing fisheries subsidies like the premix fuel as this provides an incentive for overfishing. Although this may be met by opposition from fishers, the government could address this challenge by redirecting funding towards benefical subsidies that promote investment in training and support for alternative livelihoods, fishery resource conservation, and improved management. There is also the need to increase transparency and local stakeholder participation in the signing of fishing agreements so as to enhance the trust local fishers have in local authorities, this will help them engage less in IUU fishing and help reduce the conflict between local fishers and foreign Distant Water Fleets. Also, the capacity of the FEU has to be strengthened to enable them to monitor and enforce regulations in the fisheries sector in order to reduce overfishing and in the long run help prevent decline of fish stocks.

8.4 Recommendations for Further Research

Although the study answered all outlined research questions, some of the research findings were not discussed in details because they were beyond the scope of the thesis. These issues could be explored further in future studies. Results from the study show that overfishing due to Illegal, Unreported, Unregulated (IUU) fishing, is leading to a depletion in fish stocks and is adversely affecting the livelihoods of artisanal fishers. In Ghana both industrial and artisanal fisheries have been implicated in illegal fishing practises. Some of these practices include the use of unlicensed vessels, fishing in prohibited zones, the use of illegal nets, the use of lights in fishing, under-reporting fish catch as well as pair trawling, bottom trawling and transhipment at sea by industrial vessels. Current interventions by the government to address this challenge has led to the establishment of the Fisheries Enforcement Unit (FEU) to arrest and sanction both industrial and artisanal fishers involved in IUU. Vessel Monitoring System (VMS) have also been installed on all industrial Ghanaian registered trawl fishing vessels to facilitate monitoring at sea. Although the study identified and discussed some of the government efforts to curtail IUU fishing, further research on governance of the fisheries sector is required in order to examine the institutional capacities, weaknesses and strengths in addressing IUU fishing.

Findings from the study show that as a result of a growing population there is an increasing demand for housing and infrastructure. The study communities are experiencing changes in land use patterns. Some of these changes have had negative impacts on local communities. There are several factors that influence land use decisions at the household, institutional and community level. These factors include population size, composition and spatial distribution, local perceptions about the quality of the land, technology, income, policies, legislative and institutional frameworks. Further studies would be required to examine the relationship between population growth and land use decisions at each of these levels in the study communities. This could help improve land use planning and management.

8.5 Conclusion

This thesis draws on the Pressure and Release model (PAR) and the Access model of Wisner et al., (2004) to make the arguments that the interplay of existing vulnerabilities with climate impacts exacerbates vulnerability levels and reduces adaptive capacities. It also argues that the

inability of adaptation policies to address the underlying causes of vulnerability / existing inequalities reproduces and sustains vulnerability to climate change impacts. Using a perspective that is important but often overlooked in the study of vulnerability and adaptation to climate impacts in Ghana, the thesis examines the root causes i.e. the structural and relational drivers of vulnerability and the extent to which adaptation policies address these root causes. The study contributes to the ongoing debate on the politics of adaptation, the need for adaptation policies to address the underlying causes of vulnerability specifically the social relations of power that produce inequalities. Findings from the study of food crop farmers, fishers and slum dwellers in three coastal communities in Ghana support these arguments. The results show that existing vulnerabilities created from development trajectories pursued in the past interact with climatic impacts to further exacerbate vulnerabilities and decrease adaptive capacities of households in the study communities. It also shows that unequal social relations of power drive differential vulnerability patterns among households in the study communities. The findings show that the access profile of a household influences the strategies used in responding to climatic impacts. Also, climate change related adaptation policies by government and other actors do not adequately address the underlying causes of vulnerability consequently perpetuating vulnerabilities and reducing the adaptive capacities of households in the study communities. The study concludes that for adaptation policies to be more effective they need to address the underlying causes of vulnerability / the existing inequalities that reproduce and sustain vulnerability to climate impacts and which undermine adaptive capacities.

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Appendices

Appendix 1 Climate Change Policy Actions

AGRICULTURE & FISHERIES

National Climate Change Policy (NCCP), 2013

Policy Actions for Focus Area 1: Develop Climate-resilient Agriculture and Food Systems

1. Build and strengthen the capacity of extension officers in climate smart-agriculture to enhance support to farmers and fishermen
2. Promote capacity-building for farmers and fisher folk and build awareness on climate change issues
3. Build capacity for community-level weather data collection, analysis and dissemination for agricultural planning
4. Document and promote appropriate indigenous knowledge and best practices
5. Develop climate-resilient cropping and livestock systems as well as crop varieties and livestock breeds tolerant to flooding, drought and salinity
6. Promote diversified land use practices, including agro-forestry, dry-land farming, urban/backyard vegetable production, to reduce risk and increase the capacity of farmers to cope with droughts and floods
7. Prepare and enforce spatial plans to address conflicts between peri-urban agriculture and human settlements
8. Improve productivity through improved farming technologies and practices, such as the integration of trees into farming systems, integrated nutrient management under various crops, green/organic farming, etc.
9. Promote and support agricultural diversification (livestock – crop integration as well as management practices) as a coping strategy and for income generation
10. Design and implement programmes on fisheries management and disease control, which integrate climatic and hydrological parameters
11. Provide sustained support in the use of simple agronomic soil and water conservation measures (e.g., agro-forestry, crop rotation, tied ridging, mulching, contour earth mounds, vegetative barriers and improved fallow)
12. Promote appropriate technologies for small-scale irrigation, water re-use and water harvesting (e.g., waste/water recycling), rainwater harvesting, etc.
13. Improve efficiency of farming practices through secure land tenure, effective pricing policies and access to credit
14. Institute risk transfer schemes (e.g., insurance) against local supply changes, harvest failure or weather risk
15. Promote alternative livelihood systems to diversify incomes, such as beekeeping, poultry production, piggery, snail rearing, mushroom cultivation, sustainable aquaculture, etc.
16. Improve post-harvest capacity, e.g., storage and processing facilities and infrastructure
17. Build capacity for recycling and conversion of agricultural waste
18. Improve marketing policies that increase competitiveness for the domestic and international market

National Climate Change Adaptation Strategy (NCCAS), 2012 Strategies

Agriculture

1. Build and strengthen capacity of local farmers to increase agricultural productivity and awareness of climate issues.
2. Build and strengthen capacity of extension officers in new farming technologies in order to enhance their support for farmers.
3. Enhance the living standards of vulnerable groups through acquisition of alternative livelihoods skills
4. Protect the environment through the promotion of agricultural biodiversity
5. Promote cultivation of crops and rearing of animals adapted to harsh climatic conditions
6. Document existing indigenous knowledge and best practices
7. Train trainers to promote post-harvest technologies to minimize losses of farm produce.

Fisheries Management

1. Promote fish farming
2. Design and implement programmes on fisheries management and disease control
3. Develop alternative sources of livelihoods for fisher folks

Food and Agriculture Sector Development Policy II (FASDEP II), 2007 & Medium-Term Agriculture Sector Investment Plan (METASIP), 2010

Programme 1: Food Security and Emergency Preparedness

1. Productivity Improvement
2. Improved Nutrition
3. Diversification of Livelihood Options for the Poor
4. Food Storage and Distribution
5. Early Warning Systems and Emergency Preparedness
6. Irrigation and Water Management
7. Mechanization Services

Medium-Term Agriculture Sector Investment Plan (METASIP), 2010

Priority Investments

1. Promotion of Crop, Livestock and Fishery
2. Production for income
3. Awareness Creation and Use of SLM Technologies by Men and Women Farmers
4. Uptake of Technology along the Value Chain and
5. Application of Biotechnology in Agriculture

National Climate Change Policy (NCCP), 2013

Policy Actions for Focus Area 9: Address Climate Change and Migration

1. Promote vocational training, especially for youth, in places with high likelihood of receiving in-migration
2. Invest in agriculture in vulnerable areas, such as developing crops and livestock that are pest and drought resistant, early yielding and culturally acceptable, and promoting irrigation, to help curb rural-urban migration
3. Facilitate movement between source and destination areas through improved transport systems
4. Facilitate flows of remittances and goods and services between source and destination areas
5. Target social transfers and safety nets; include migrants in the social safety nets
6. Improve access to microcredit among migrants
7. Promote alternative livelihood programmes to develop skills among rural dwellers
8. Facilitate the proper utilization of rural and peri-urban lands by improving land use and land management schemes (move to natural resources)
9. Provide social protection for immigrants
10. Increase accessibility to quality health care for immigrants
11. Mainstream migration into national development frameworks
12. Establish a national institution for the management of migration for development
13. Enforce rules and regulations of housing and sanitation

National Climate Change Adaptation Strategy (NCCAS),2012 Strategies

Livelihoods

1. Improve output and income of vulnerable groups
2. Create awareness on climate change and its adaptation strategies
3. Sensitize beneficiaries on the need to adopt new and appropriate technologies on economic and non-economic livelihoods
4. Improve access to credit facilities
5. Build technical and financial capacities on alternative livelihoods mechanisms
6. Strengthen the relationship between scientific knowledge and traditional or indigenous knowledge

WATER

National Climate Change Policy (NCCP), 2013

Policy Actions for Focus Area 7: Minimise Impacts of Climate Change on Access to Water and Sanitation

1. Develop rainwater harvesting and increased use of shallow wells, dugout ponds and dams for water use
2. Make water accessible for domestic, agricultural, industrial, and commercial use and energy production
3. Recycle water for domestic and industrial purposes
4. Develop efficient irrigation drainage systems to increase return flows
5. Build capacity in water resources management in relevant sectors
6. Promote water supply and sanitation delivery practices that build resilience to climate change
7. Develop and introduce flood and drought monitoring and control systems

8. Develop and implement environmental sanitation strategies to adapt to climate change
9. Strengthen District Assemblies to assume a central role in supporting community management of water and sanitation facilities
10. Reduce methane from landfills through waste reduction and recycling
11. Improve construction of hydropower schemes, irrigation systems and water supply infrastructure to improve efficiency
12. Implement drinking water and sanitation programmes in areas at risk from climate change (e.g., coastal areas, flood- and drought-prone areas)
13. Provide economic incentives to manage water resources including watersheds to furnish a sustainable and clean supply of water in addition to other ecosystem services and climate benefits
14. Improve the status of environmental sanitation through strengthening of institutions and enforcement of laws

National Climate Change Adaptation Strategy (NCCAS), 2012 Strategies

Water

1. Preserve/conserve water resources
2. Make water accessible for domestic, agricultural, industrial, and commercial use and energy production.
3. Increase water availability for domestic, industrial, agricultural, and energy production
4. Improve and sustain the quality of water resources.
5. To build capacity in water resources management.

HEALTH

National Climate Change Policy (NCCP), 2013

Policy Actions for Focus Area 6: Address Impacts of Climate Change on Human Health

1. Establish community health groups and development of capacity to identify health risks and facilitate access to services and decision makers
2. Strengthen technical capacity to manage climate-change-related health risks
3. Strengthen disease surveillance systems through early warning
4. Improve data sharing and develop health information management systems for diseases including climate-sensitive diseases at all levels of the health delivery system
5. Improve partnerships between relevant ministries and other stakeholders to improve access to potable water, instead of direct dependence on natural water bodies, and environmental sanitation
6. Map disease incidence and identification of vulnerable groups for climate-sensitive diseases
7. Strengthen existing units within the health delivery system to manage climate-related epidemics
8. Collaborate with relevant stakeholders to improve nutrition through increased food processing capacity, food banks, nutrition education, and food storage and quality control
9. Improve surveillance systems for existing and new disease risks and ensure health care systems are geared up to meet future demands
10. Mainstream climate change health risks into decision-making at local and national health policy levels
11. Identify, document and incorporate climate-relevant traditional knowledge into health delivery systems and practices
12. Develop structures to effectively manage and disseminate information on climate change health risks.

National Climate Change Adaptation Strategy (NCCAS),2012 Strategies

Health

1. Create national awareness on climate change and its impacts on health, livelihood and environmental sanitation.
2. Improve environmental sanitation by strengthening institutions and enforcement of laws and bye laws.
3. Improve existing waste management infrastructure and provide new and affordable technologies for environmental sanitation.
4. Enhance and strengthen policies and bye laws in relation to spatial distribution of residential, commercial, industrial and recreational areas.
5. Reduce the incidence of water and air –borne diseases.
6. Improve capacities of health workers to cope with climate change health related problems
7. Increase and upgrade existing health facilities and equipment
(ambulance, health centers Community-based Health Planning and Services (CHPS), mobile health vans, helicopter)
8. Develop and strengthen a network of rapid disaster response team.

INFRASTRUCTURE

National Climate Change Policy (NCCP), 2013

Policy Actions for Focus Area 2: Build Climate-resilient Infrastructure

1. Improve technical and institutional capacity through research support and training
2. Conduct research on appropriate infrastructure design standards that meet higher requirements against extreme weather-related natural hazard events
3. Improve hydro-meteorological observation networks to provide better climate data and information, and communicate early warning of natural hazards
4. Collect relevant data on coastal zone geomorphology, surface water flows and groundwater for modelling coastal flooding
5. Provide enabling policy environment to ensure climate resilience in urban planning, construction codes and management
6. Revise design standards, building codes and spatial planning to include climate change parameters
7. Climate-proof important infrastructure that provide key services so that communities are less exposed and vulnerable during extreme events
8. Construct proper storm drainage systems, riverbank protection, buffer zones, and undertake afforestation along embankments and other measures to reduce flooding
9. Construct channels, water collecting reservoirs and dams to contain floods and store water for the dry season
10. Encourage relocation of settlements and economic activities from climate-related disaster-prone areas
11. Use information and communication technologies (ICT) in monitoring climate events and providing an early warning system
12. Develop and implement strategies to change systems and make people adapted to climate change, e.g., harvesting rainwater and storage of grains can aid communities in adapting
13. Ensure that rural communities have reliable access to markets, key services and lifeline facilities
14. Develop climate-resilient standards for key coastal infrastructure and protection of coastal communities from storm surges, coastal flooding and sea-level rise

GENDER

National Climate Change Policy (NCCP), 2013

Policy Actions for Focus Area 8: Address Gender Issues in Climate Change

1. Ensure the integration of gender equality principles in all social policies such as education, health, water and sanitation
2. Generate gender-specific information including sex-disaggregated data for determining the gender impacts of climate change
3. Develop effective gender and climate change goals and gender-sensitive indicators
4. Collaborate with CSOs, especially women's rights organisations and coalitions, in climate change discussions and processes
5. Build the capacity of the relevant institutions to mainstream gender issues into climate change policy formulation, planning, monitoring and evaluation
6. Prepare and implement gender and climate change mainstreaming strategic plans by institutions, which would provide a sound basis for evaluating the extent of gender mainstreaming
7. Identify and analyse gender-specific needs, impacts, protection and support measures related to climate change and variability such as floods, droughts and diseases
8. Promote gender equitable financing as a means of responding to the differential impacts of climate change by gender. This will require establishing clear mechanisms for integrating a gender dimension into the design, implementation and monitoring of all climate funds
9. Increase the resilience of vulnerable groups, including women and children, through the development of community-led adaptation, livelihood diversification, better access to basic services and social protection (safety nets, insurance)
10. Integrated biomass strategies for food, fuel, fodder, and other basic needs including income generation
11. Promote effective and equal participation of men and women in climate change policy and decision-making processes
12. Strengthen the implementation of gender responsiveness in disaster risk management.

Appendix 2 Fishing Community Interview Guide

Households - Semi Structured Interviews

- **Household Composition and Characteristics**

What are the sex, age, occupation and educational level (highest) of household members?

What is the religion and ethnic group of the household?

What is the household size?

- **Climate change impacts and adaptation**

How has your life changed in the last 10/20/30 years? (Natural, economic and social environment)

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's etc..)

Have the changes in the climate had any impact on the timing of fishing, quantity of fish catch and the species of fish that are caught?

How does it affect the fishing, storing and selling of fishes (e.g. more cooling needed, more storms may mean less frequent trips, different type of fish caught)? How does it affect your daily lives and your livelihoods? How does it affect food security?

How are you coping with these changes?

- Changing fishing practices/ techniques (Adapt fishing periods, aquaculture, increase storage facilities etc…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration

What crises have the household faced in the past (storms, floods, pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases? Does it affect access to food? Does it affect the household's income level?

What impact does it have on your livelihood?

What impact does it have on the availability of water / water access / water quality?

- **Gender Roles**

How are fishing activities divided between household members?
What does the daily routine of men and women in the household involve?
How are fishing activities divided between men and women? / What are the different roles of men and women in fishing activities? Why? (fishing, processing, storage and selling)
How are women / men impacted by climatic changes? How do they adapt to climatic changes?

- **Livelihood Strategies**

A. Natural capital

What resources/ assets do household members use in pursuing livelihood strategies? (Land, water, livestock, forest etc…)
What are these resources used for?

What are the terms of access of these assets (ownership, rental, share arrangements, open-access, leasing)?
Who makes decisions about the use of these resources in the community? How are these decisions made?
What laws, rules and regulations affect the use of these resources?

B. Physical capital

What infrastructure do household members have access to and use (transport, market access, health services, water supply /potable water, electricity, sanitation)?
What infrastructure do they not have access? why?
What are the terms of access to different types of infrastructure (payment, open access, individual or "pooled", etc.)?
What tools or equipment do household members use during different livelihood activities and what are the terms of access to them (ownership, hire, sharing, etc.)?

C. Social Capital

What links does the household have with other households or individuals in the community (kinship, social group, membership of organizations, political contacts)?
What support or assistance do you get from these relationships?
What organizations, institutions and associations (societies, cooperatives, political parties, etc.) do household members belong to and what role do they play in them?

D. Financial capital

What are the income-generating activities of the household?
What are the earnings of the household from these activities?
What other sources of finance are available and how accessible are these (bank credit, NGO support, remittances, etc.)?

4. Knowledge about formal climate policies / projects
Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in your lives? If yes, how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

COMMUNITY LEVEL, Men and Women – Focus Group Discussion

- **Introduction**

Names, sex, and occupation

- **Historical Timeline**

What are the main events that have taken place in the community in the last 10/20/30 years? (Political, social events, environment etc...)

When did these events take place?

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's etc.?)

Have the changes in the climate had any impact on the timing of fishing, quantity of fish catch and the species of fish that are caught?

How does it affect the fishing, storing and selling of fishes (e.g. more cooling needed, more storms may mean less frequent trips)? How does it affect your daily lives and your livelihoods? How does it affect food security?

How are you coping with these changes?

- Changing fishing practices/ techniques (Adapt fishing periods, aquaculture, increase storage facilities etc.…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration

What crises have the community faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

- **Gender Roles**

How are fishing activities divided between household members?
What does the daily routine of men and women in the household involve?
How are fishing activities divided between men and women? / What are the different roles of men and women in fishing activities? Why? (Fishing, processing, storage and selling)
How are women / men impacted by climatic changes? How do they adapt to climatic changes?

- **Hazard Maps**

What extreme weather events affect this community? (floods, storms, drought, etc...)

Are they different now than they were 10/20/30 years ago? How?

Which areas are at most at risk from the extreme weather events identified? Why?

How do extreme weather events affect the community? (water supply, housing facilities etc…)

Are there places in the community that are safe from the extreme weather events identified?

Who are the members of the community who are most at risk from the extreme weather events identified? Why?

How do people in the community currently cope with the impacts of the extreme weather events identified?

Are the current coping strategies working? Are they sustainable?

Who has access to the resources shown on the map? Who controls this access?

- **Seasonal Calendars**

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases, does it affect access to food, does it affect the households' income level?

What impact does it have on your livelihood?

What are the current strategies you are using to cope with these impacts? Are they working?

What are the most important livelihoods strategies employed at different points of the year?

Are there any differences in the main fishing seasons as compared to 10/20/30 years ago?

Have livelihoods/coping strategies changed based on the timing of seasons or events?

How does the timing of the seasons affect decisions on livelihood strategies?

- **Vulnerability Matrix**

Categories of resources	**Resources (**identify 4 most important resources**)**	**Hazards**		
		Drought	**Floods**	**etc.**

Human				
Social				
Physical				
Natural				
Physical				

The scoring system will be rated from **0 – 3** where:
3 = significant impact/ risk on the resource
2 = medium impact/ risk on the resource
1 = low impact/ risk on the resource
0 = no impact/ risk on the resource

Discussion questions - After drawing matrix
What are the most important livelihoods resources in the community?
What are the major hazards that affect these livelihoods? (Climate - related hazards as well as man-made)
What coping strategies are currently used to deal with the hazards identified? Are they working?
Are there different strategies that could be adopted which could reduce the impact of hazards on livelihoods?
What resources are available to help adopt these new strategies?
What are the constraints to adopting these new strategies?

- **Relationship with Institutions - Question guide**

Which organizations/institutions/groups work with this community?

How often does the community have contacts with these organizations?

In which ways has the community benefited from these organizations?

Have they offered help or assistance to the community in times of crisis?

Has any organization/institution worked specifically with you on climate change?

- **Knowledge about formal climate policies / projects**

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in the lives of community members? If yes, how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

Youth – Focus Group Discussion

1. Introduction

Names, sex, educational level and occupation

2. Perception of Climate Change

Have you noticed any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last few years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms etc…?)

Are these changes associated with any diseases, does it affect access to food, does it affect the household's income level?

Have your parents / grandparents talked about how the weather / climate has changed between now and when they were young?

Have the changes in the climate had any impact on the timing of fishing, quantity of fish catch and the species of fish that are caught?

How does it affect the fishing, storing and selling of fishes (e.g. more cooling needed, more storms may mean less frequent trips)? How does it affect your daily lives and your livelihoods? How does it affect food security?

How are you coping with these changes?

- Changing fishing practices/ techniques (Adapt fishing periods, aquaculture, increase storage facilities etc…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration

Are you a member of any social group? If yes does this group provide you with information about climate related hazards and how to cope with them?

Do you study about climate change issues at school?

Local Leaders - Semi structured interviews

(Assembly Men, District chief executives, Municipal chief executives, Chiefs)

Introduction

Name ,sex
What is your current position and responsibilities?

Climate change impacts and adaptation

How has life changed in the community in the last 10/20/30 years? (Natural, economic and social environment)

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's etc.?)

How have these changes affected lives in general (livelihoods, food supply, income, expenditure etc.)?
Have the changes in the climate had any impact on the timing of fishing, quantity of fish catch and the species of fish that are caught?

How does it affect the fishing, storing and selling of fishes (e.g. more cooling needed, more storms may mean less frequent trips)? How does it affect the daily lives and livelihoods of community members? How does it affect food security?

How are community members coping with these changes?

- Changing fishing practices/ techniques (Adapt fishing periods, aquaculture, increase storage facilities etc…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration

In your opinion are there different strategies that could be adopted which could reduce the impact of climate change on livelihoods?
What resources are available to help adopt these new strategies?
What are the constraints to adopting these new strategies?

What crises has the community faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases? Does it affect access to food? Does it affect income levels?

What impact does it have on livelihoods?

What impact does it have on the availability of water / water access / water quality?

Relationship with Institutions - Question guide

Which organizations/institutions/groups work with this community?

How often does the community have contacts with these organizations?

In which ways has the community benefited from these organizations?

Have they offered help or assistance to the community in times of crisis?

Has any organization/institution worked specifically with you on climate change?

Knowledge about formal climate policies / projects

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?

Has this programme brought about any changes in the lives of community members? If yes, how?

Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?

Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?

If no, what kind of government support would be helpful for your situation?

Appendix 3 Farming Community Interview Guide

Households - Semi structured interviews

- **Household Composition and Characteristics**

What are the sex, age, occupation and educational level (highest) of household members?

What is the religion and ethnic group of the household?

What is the household size?

- **Climate change impacts and adaptation**

How has your life changed in the last 10/20/30 years? (Natural, economic and social environment)

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's etc.?)

How have these changes affected your lives in general (livelihoods, food supply, income, expenditure etc.)?

Have the changes in the climate had any impact on planting, cultivation and harvesting of plants / on animal rearing? How does it affect your daily lives and your livelihoods? How does it affect food security?
How are you coping with these changes?

- Changing agriculture practices/ techniques (adapt planting dates, change seed varieties etc.…)
- Changing water management techniques (water harvesting, irrigation etc.…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Developing new strategies (crop insurance, micro-credits etc.)
- Migration

What crises have the household faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases? Does it affect access to food? Does it affect the household's income level?

What impact does it have on your livelihood?

What impact does it have on the availability of water / water access / water quality?

- **Gender Roles**

  How are farming activities divided between household members?
  What does the daily routine of men and women in the household involve?
  How are farming activities divided between men and women? / What are the different roles of men and women in farming activities? Why?
  How are women / men impacted by climatic changes? How do they adapt to climatic changes?

- **Livelihood Strategies**

A. Natural capital

What resources/ assets do household members use in pursuing livelihood strategies? (Land, water, livestock, forest etc.…)
What are these resources used for?
What are the terms of access of these assets (ownership, rental, share arrangements, open-access, leasing)?
Who makes decisions about the use of these resources in the community? How are these decisions made?

What laws, rules and regulations affect the use of these resources?

B. Physical capital

What infrastructure do household members have access to and use (transport, market access, health services, water supply /potable water, electricity, sanitation)?
What infrastructure do they not have access? why?
What are the terms of access to different types of infrastructure (payment, open access, individual or "pooled", etc.)?
What tools or equipment do household members use during different livelihood activities and what are the terms of access to them (ownership, hire, sharing, etc.)?

C. Social Capital

What links does the household have with other households or individuals in the community (kinship, social group, membership of organizations, political contacts)?
What support or assistance do you get from these relationships?
What organizations, institutions and associations (societies, cooperatives, political parties, etc.) do household members belong to and what role do they play in them?

D. Financial capital

What are the income-generating activities of the household?
What are the earnings of the household from these activities?
How many boxes of item x do you sell per harvest? How much is each box, bag, sack or basket of item x?
What other sources of finance are available and how accessible are these (bank credit, NGO support, remittances, etc.)?

4. Knowledge about formal climate policies / projects

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in your lives? If yes, how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

COMMUNITY LEVEL

Men and Women - FGD

- **Introduction**

Names, sex, and occupation

- **Historical Timeline**

What are the main events that have taken place in the community in the last 10/20/30 years? (Political, social events, environment etc...)

When did these events take place?

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's etc.?)

How have these changes affected the lives of community members (livelihoods, food supply, income, expenditure etc.)?
Have the changes in the climate had any impact on planting, cultivation and harvesting of plants / on animal rearing? How does it affect your daily lives and your livelihoods? How does it affect food security?
How are community members coping with these changes?

- Changing agriculture practices/ techniques (Adapt planting dates, change seed varieties etc…)
- Changing water management techniques (Water harvesting, irrigation etc…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration

What crises have the community faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

- **Gender Roles**

How are farming activities divided between household members?
What does the daily routine of men and women of the household involve?
How are farming activities divided between men and women? / What are the different roles of men and women in farming activities? Why?

How are women / men impacted by climatic changes? How do they adapt to climatic changes?

- **Hazard Maps**

What extreme weather events affect this community? (floods, storms, drought, etc...)

Are they different now than they were 10/20/30 years ago? How?

Which areas are at most at risk from the extreme weather events identified? Why?

How do extreme weather events affect the community? (water supply, housing facilities etc.…)

Are there places in the community that are safe from the extreme weather events identified?

Who are the members of the community who are most at risk from the extreme weather events identified? Why?

How do people in the community currently cope with the impacts of the extreme weather events identified?

Are the current coping strategies working? Are they sustainable?

Who has access to the resources shown on the map? Who controls this access?

- **Seasonal Calendars**

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases, does it affect access to food, does it affect the household's income level?

What impact does it have on your livelihood?

What are the current strategies you are using to cope with these impacts? Are they working?

What are the most important livelihoods strategies employed at different points of the year?

Are there any differences in the main growing and harvesting seasons as compared to 10/20/30 years ago?

Have livelihoods/coping strategies changed based on the timing of seasons or events?

How does the timing of the seasons affect decisions on livelihood strategies?

- **Vulnerability Matrix**

Categories of resources	**Resources (**identify 4 most important resources**)**	**Hazards**		
		Drought	**Floods**	**etc.**
Human				
Social				
Physical				
Natural				
Physical				

The scoring system will be rated from **0 – 3** where:

3 = significant impact/ risk on the resource

2 = medium impact/ risk on the resource

1 = low impact/ risk on the resource

0 = no impact/ risk on the resource

Discussion questions - After drawing matrix

What are the most important livelihoods resources in the community?

What are the major hazards that affect these livelihoods? (Climate - related hazards as well as man-made)

What coping strategies are currently used to deal with the hazards identified? Are they working?

Are there different strategies that could be adopted which could reduce the impact of hazards on livelihoods?

What resources are available to help adopt these new strategies?

What are the constraints to adopting these new strategies?

- **Relationship with institutions - Question guide**

Which organizations/institutions/groups work with this community?

How often does the community have contacts with these organizations?

In which ways has the community benefited from these organizations?

Have they offered help or assistance to the community in times of crisis?

Has any organization/institution worked specifically with you on climate change?

- **Knowledge about formal climate policies / projects**

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in the lives of community members? If yes, how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

Youth - FGD

3. Introduction

Names, sex, educational level and occupation

4. Perception of Climate Change

Have you noticed any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last few years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms etc.…?)

Are these changes associated with any diseases, does it affect access to food, does it affect the household's income level?

Have your parents / grandparents talked about how the weather / climate has changed between now and when they were young?

Have the changes in the climate had any impact on planting, cultivation and harvesting of plants / on animal rearing? How does it affect your daily lives? How does it affect food security?
How are they coping with these changes?

- Changing agriculture practices/ techniques (Adapt planting dates, change seed varieties etc.…)
- Changing water management techniques (Water harvesting, irrigation etc.…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration

Are you a member of any social group? If yes does this group provide you with information about climate related hazards and how to cope with them?

Do you study about climate change issues at school?

Local Leaders - Semi structured interviews

(Assembly Men, District chief executives, Municipal chief executives, Chiefs)

Introduction

Name, sex
What is your current position and responsibilities?

Climate change impacts and adaptation

How has life changed in the community in the last 10/20/30 years? (Natural, economic and social environment)

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's etc.?)

How have these changes affected lives in general (livelihoods, food supply, income, expenditure etc.)?
Have the changes in the climate had any impact on planting, cultivation and harvesting of plants / on animal rearing? How does it affect the daily lives and livelihoods of community members? How does it affect food security?
How are community members coping with these changes?

- Changing agriculture practices/ techniques (Adapt planting dates, change seed varieties etc.…)
- Changing water management techniques (Water harvesting, irrigation etc.…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration

In your opinion are there different strategies that could be adopted which could reduce the impact of climate change on livelihoods?
What resources are available to help adopt these new strategies?
What are the constraints to adopting these new strategies?

What crises have the community faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases? Does it affect access to food? Does it affect income levels?

What impact does it have on livelihoods?

What impact does it have on the availability of water / water access / water quality?

Relationship with Institutions - Question guide

Which organizations/institutions/groups work with this community?

How often does the community have contacts with these organizations?

In which ways has the community benefited from these organizations?

Have they offered help or assistance to the community in times of crisis?

Has any organization/institution worked specifically with you on climate change?

Knowledge about formal climate policies / projects

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in the lives of community members? If yes, how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

Appendix 4 Informal Community Interview Guide

Households - Semi structured interviews

- **Household Composition and Characteristics**

What are the sex, age, occupation and educational level (highest) of household members?

What is the religion and ethnic group of the household?

What is the household size?

- **Climate change impacts and adaptation**

How has your life changed in the last 10/20/30 years? (Natural, economic and social environment)

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's, landslides etc.?)

Have the changes in the climate had any impact on water supply, sanitation, housing facilities living conditions, food security, electricity access etc. Have there been occurrences of diseases, such as cholera (water-borne), malaria (vector-borne through mosquitoes)?

How does it affect your daily lives and your livelihoods?

How are you coping with these changes?

- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration
- Changing water management techniques (Water harvesting etc.)
- Changing building techniques
- Changing energy supply
- Improving drainage and sanitation facilities

What crises have the household faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases? Does it affect access to food? Does it affect the household's income level?

What impact does it have on your livelihood?

What impact does it have on the availability of water / water access / water quality?

- **Livelihood Strategies**

A. Natural capital

What resources/ assets do household members use in pursuing livelihood strategies? (Land, water, livestock, forest etc…)
What are these resources used for?
What are the terms of access of these assets (ownership, rental, share arrangements, open-access, leasing)?

Who makes decisions about the use of these resources in the community? How are these decisions made?
What laws, rules and regulations affect the use of these resources?

B. Physical capital

What infrastructure do household members have access to and use (transport, market access, health services, water supply /potable water, electricity, sanitation)?
What infrastructure do they not have access? why?
What are the terms of access to different types of infrastructure (payment, open access, individual or "pooled", etc.)?
What tools or equipment do household members use during different livelihood activities and what are the terms of access to them (ownership, hire, sharing, etc.)?

C. Social Capital

What links does the household have with other households or individuals in the community (kinship, social group, membership of organizations, political contacts)?
What support or assistance do you get from these relationships?
What organizations, institutions and associations (societies, cooperatives, political parties, etc.) do household members belong to and what role do they play in them?

D. Financial capital

What are the income-generating activities of the household?
What are the earnings of the household from these activities?
What other sources of finance are available and how accessible are these (bank credit, NGO support, remittances, etc.)?

- **Knowledge about formal climate policies / projects**

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in your lives? If yes how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

COMMUNITY LEVEL Focus Group Discussion

Men and Women - FGD

- **Introduction**

Names, sex, and occupation

- **Historical Timeline**

What are the main events that have taken place in the community in the last 10/20/30 years? (Political, social events, environment etc...)

When did these events take place?

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's and landslides etc.?)

Have the changes in the climate had any impact on water supply, sanitation, housing facilities living conditions, food security etc. Have there been occurrences of vector- and water-borne diseases

How does it affect your daily lives and your livelihoods?

How are you coping with these changes?

- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration
- Changing water management techniques (Water harvesting etc.)
- Changing building techniques
- Improving drainage and sanitation facilities

What crises have the community faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

- **Hazard Maps**

What extreme weather events affect this community? (floods, storms, drought, etc...)

Are they different now than they were 10/20/30 years ago? How?

Which areas are at most at risk from the extreme weather events identified? Why?

How do extreme weather events affect the community? (water supply, housing facilities etc…)

Are there places in the community that are safe from the extreme weather events identified?

Who are the members of the community who are most at risk from the extreme weather events identified? Why?

How do people in the community currently cope with the impacts of the extreme weather events identified?

Are the current coping strategies working? Are they sustainable?

Who has access to the resources shown on the map? Who controls this access?

- **Seasonal Calendars**

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases, does it affect access to food, does it affect the household's income level?

What impact does it have on your livelihood?

What are the current strategies you are using to cope with these impacts? Are they working?

What are the most important livelihoods strategies employed at different points of the year?

Have livelihoods/coping strategies changed based on the timing of seasons or events?

How does the timing of the seasons affect decisions on livelihood strategies?

- **Vulnerability Matrix**

Categories of resources	**Resources (**identify 4 most important resources**)**	**Hazards**		
		Drought	**Floods**	**etc.**
Human				
Social				
Physical				
Natural				
Physical				

The scoring system will be rated from **0 – 3** where:
3 = significant impact/ risk on the resource
2 = medium impact/ risk on the resource
1 = low impact/ risk on the resource
0 = no impact/ risk on the resource

Discussion questions - After drawing matrix
What are the most important livelihoods resources in the community?
What are the major hazards that affect these livelihoods? (Climate - related hazards as well as man-made)
What coping strategies are currently used to deal with the hazards identified? Are they working?
Are there different strategies that could be adopted which could reduce the impact of hazards on livelihoods?
What resources are available to help adopt these new strategies?
What are the constraints to adopting these new strategies?

- **Relationship with Institutions - Question guide**

Which organizations/institutions/groups work with this community?

How often does the community have contacts with these organizations?

In which ways has the community benefited from these organizations?

Have they offered help or assistance to the community in times of crisis?

Has any organization/institution worked specifically with you on climate change?

- **Knowledge about formal climate policies / projects**

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in the lives of community members? If yes how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

Youth – Focus Group Discussion

Introduction

Names, sex, educational level and occupation

Perception of Climate Change

Have you noticed any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last few years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's and landslides etc.?)

Are these changes associated with any diseases, does it affect access to food, does it affect the household's income level?

Have your parents / grandparents talked about how the weather / climate has changed between now and when they were young?

Have the changes in the climate had any impact on water supply, sanitation, housing facilities living conditions, food security etc. Have there been occurrences of vector- and water-borne diseases?

How does it affect your daily lives and your livelihoods?

How are you coping with these changes?
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration
- Changing water management techniques (Water harvesting etc.)
- Changing building techniques
- Improving drainage and sanitation facilities

Are you a member of any social group? If yes does this group provide you with information about climate related hazards and how to cope with them?

Do you study about climate change issues at school?

Local Leaders - Semi structured interviews

(Assembly Men, District chief executives, Municipal chief executives, Chiefs)

Introduction

Name, sex
What is your current position and responsibilities?

Climate change impacts and adaptation

How has life changed in the community in the last 10/20/30 years? (Natural, economic and social environment)

Have there been any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last 10/20/30 years? Have their frequency changed over time?

Have you experienced any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's, landslides etc.?)

Have the changes in the climate had any impact on water supply, sanitation, housing facilities living conditions, food security etc. Have there been occurrences of vector- and water-borne diseases?

How does it affect your daily lives and your livelihoods?

How are you coping with these changes?

- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Migration
- Changing water management techniques (Water harvesting etc.)
- Changing building techniques
- Improving drainage and sanitation facilities

In your opinion are there different strategies that could be adopted which could reduce the impact of climate change on livelihoods?
What resources are available to help adopt these new strategies?
What are the constraints to adopting these new strategies?

What crises has the community faced in the past (pest, diseases, natural disasters, crop failures, etc...) and how did it deal with them?

What is the seasonal weather pattern in a year?

Are these seasonal changes associated with any diseases? Does it affect access to food? Does it affect income levels?

What impact does it have on livelihoods?

What impact does it have on the availability of water / water access / water quality?

Relationship with Institutions - Question guide

Which organizations/institutions/groups work with this community?

How often does the community have contacts with these organizations?

In which ways has the community benefited from these organizations?

Have they offered help or assistance to the community in times of crisis?

Has any organization/institution worked specifically with you on climate change?

Knowledge about formal climate policies / projects

Are there any government policies / ongoing programmes to address climate related hazards (floods, droughts, etc.) in your community? If yes, which ones?
Has this programme brought about any changes in the lives of community members? If yes how?
Are there any financial schemes available from the government to help in respect of climatic impacts? If yes, which ones?
Is any other kind of government support or intervention available with regard to climatic impacts? If yes, which ones?
If no, what kind of government support would be helpful for your situation?

Appendix 5 Key Informants Interview Guide

KEY INFORMANTS

Semi structured interview for institutional actors (Ministries and Departments, NGOs, (working in the local community), International organizations (that play a role in climate change issues)

Introduction

Name, sex

What is your current position and responsibilities?

Perception of Climate Change

Have you noticed any changes in the temperature and rainfall patterns (the intensity, quantity and time) in the last few years? Have their frequency changed over time?

Have you noticed any extreme weather conditions such as temperature increases, droughts, tropical storms, flooding's etc.?)

In your opinion how are local communities adapting to these changes?

- Changing agriculture/ fishing practices/ techniques (Adapt planting dates, change seed varieties fishing times, etc.…)
- Changing water management techniques (Water harvesting, irrigation etc.…)
- Livelihood diversification (engaging in new activities)
- Communal pooling (seeking help from neighbours, family, community)
- Finding new solutions (e.g. insurances, micro-credits etc.)
- Migration
- Changing building techniques
- Improving drainage and sanitation facilities

What are the key government policies in place to address climate change in Ghana?

Identifying Actors

Who are the main actors involved in formulating and implementing climate policies? What are their roles?

Who sets the policy agenda? What role did your ministry / institution / organization play in developing these policies? At which stage/s were you involved?

How have these policies been formulated and implemented?

What was the role of the Politicians, the Government (various ministries), Donors, NGOs / civil society organizations and Local communities?

Which organization / institutions are responsible for monitoring the implementation of these policies?

How do you work with local communities to help them adapt to climate change?

What regional / local initiatives exist for climate change adaptation? Where?

Identifying Narratives

What do you think were the main driving factors/ notion behind the development of the policy?
Which groups were advocating for these policies?
What group /sector does this policy target?
What concerns of this group does the policy seek to address? Why these particular concerns?
Which groups are most informed / least informed about climate change?

To what extent do these policies affect local communities?
To what extent has local knowledge been incorporated into the policies?

Identifying Politics and interests

Who are the primary beneficiaries of these policies?
How do you reach these beneficiaries?
How do you reach local communities that are affected by climate change?
How are these projects financed? (Donors, internally generated etc.…)
How much of the budget is allocated for climate adaptation issues at the national, regional, and district level)?
Was there a national / international influence to develop these policies? If so how evident was this?
In your opinion do you think priority has been given to climate change adaptation policies over other policies? If yes, why? If no, why not?
What do you do to translate climate policies into action? Who do you work with to do so?