

Gender Perspectives of Climate Change Coping and Adaptive Strategies in Ghana



2012

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Financed by UN Women

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ACKNOWLEDGEMENTS

The authors would like to thank UN Women which provided the financial support for this study. We extend our gratitude to Ephraim Denteh and Paul Kretchy who helped us with the data collection. We deeply appreciate the community leaders in Kwanyaku and Keta for their assistance especially Nana Ampim Darko Chief of Agona Kwanyaku and Gladys Kwatema. Special thanks also go to all the participants from the communities in Kwanyaku and the Keta Municipality for their interest, cooperation and time. Without their cooperation and patience this work would not have been completed.

EXECUTIVE SUMMARY

Ghana's climate is changing: historical data for Ghana across the country from the year 1960 to 2000 clearly shows a progressive rise in temperature of about 1°C in the last 30 year, decrease in mean annual rainfall in all agro-ecological zones in the country and also shows a sea-level rise of 2.1 mm per year over the last 30 years. Even though the country's contribution to the global climate change problem is negligible, the impact of climate change on the Ghanaian economy is substantial. Some impacts are already being felt and there is enough national evidence that further change will occur.

Ghana's dependence on sectors that are vulnerable to the effects of climate swings and changes is considerable (agriculture, forestry, for example), and the relatively poorly developed infrastructure in both rural and urban areas means that the vagaries of the weather can easily wreak havoc on people's lives (the amount and quality of harvests in the absence of irrigation/ water storage and reliable post-harvest techniques); the loss to life, property and workplaces caused by floods.

In Ghana, women constitute about 50.5% of the total population and they have key roles in several productive sectors, but, in particular, agriculture. They constitute 52% of the agriculture labour force, contribute 46% to the total GDP and produce 70% of subsistence crops. Women are in charge of 85% of food distribution in the country, but in spite of women's huge contributions in these and other areas, there is a range of socio-economic factors that adversely affect both women's actual productivity and their potential for increased outputs and the development of well-being in these sectors.

The study sought to begin to identify these factors: to understand farmers' indigenous knowledge; identify gender gaps in this knowledge; and ways in which both men and women, cope and adapt to climate change. We also tried to identify gaps in knowledge and pinpoint areas where scientists and other stakeholders including extension agents could provide vital inputs to assist farmers.

Although traditional knowledge has generated long established coping mechanisms at the community level, it is likely that it cannot provide future proofing against current potentially devastating climatic fluctuations. We wanted to find out whether traditional knowledge arrays were being used to the best advantage in providing local solutions to join up the dots of potentially selective knowledge sources and ensure that they were used in the most appropriate ways in challenging climatic conditions, obviating the need for relatively expensive and imported top-down technologies.

In particular we wanted to show how women, as key stakeholders and with their traditional knowledge, could enhance their roles in national development based on 'intermediate' technological proposals.

The study was conducted in two communities, Keta on the eastern coast in the Volta Region and Kwanyaku a farming area in the Central Region. Both quantitative and qualitative research techniques including participatory rural appraisal in the form of focus group discussions and key informant interviews were used.

Most respondents 166 (83%) had noticed changes in weather/climate and impacts in recent times. Only a third of the people interviewed correctly defined climate change and still fewer knew about the signs and impacts of climate change. Though about 60% of respondents knew some of the causes of climate change, 40% could not correctly identify the causes of climate change.

More men had heard about climate change compared to women, but most people realized that, because of gender divisions of labour within communities, the men and women would probably be differently affected by climatic impacts. Access and control of natural resources differed in the communities and for different activities. In Kwanyako both men and women farmers had limited control over farm lands since these were rented. Land owners were probably less vulnerable to climate change impacts. Most land owners were, in fact, men. In activities where women and men had equal access to and control over resources, women still lost out because of cultural norms. Men by their role as household heads had control over profits. The survey showed that in general men had more access to and control over money and other resources. Respondents identified access for both men and women to financial resources as key in improving their lives, but also identified a gender gap in allocation of access. They expressed the need for greater availability to microfinance/loans.

Most communities have some coping strategies. Traditional strategies for coping during flooding, water scarcity and droughts were *ad hoc* and not planned systematically, as disasters were rare and adverse conditions were not expected to happen frequently. However, our respondents identified the changes in seasons and had started changing planting dates to coincide with new seasonal patterns, planting short-term crops and identifying some alternate livelihoods. In Keta women fishing net owners go into vegetable farming in order to build up their capital and supplement their income. The men undertake animal rearing, basketry, kente weaving and production of batik as their coping strategies. Some men acquire both high and low lands for farming so that in times of flooding they can rely on the proceeds from the farms at the higher elevation.

In our analysis and conclusions we identified a range of strategies and policy proposals, for example, development of policies and legislation to improve women's access and control over assets and finances as well as ensuring equitable distribution and availability of resources; improvement of equitable access to appropriate information, technology, skills and infrastructure in adaptation strategies like irrigation; empowerment of women and men by providing access to microfinance to improve their ability to expand their farms and diversify as well as go into alternate livelihoods during disaster situations; and improvement in human and institutional capacity development in climate change, gender and other issues of environmental sustainability.

1.0 BACKGROUND

1.1 INTRODUCTION

Ghana has a tropical climate, the southeast coast being comparatively warm and dry, while the southwest is hot and humid and the north is hot and dry. The climate in the northern part of the country greatly differs from that of the south. The southern part of Ghana has two distinct rainy seasons from May to June and August to September. The Harmattan, which is a dry, northeasterly wind, blows in the months of January and February. Average annual rainfall is 83 cms in the coastal regions.

There is growing evidence of changes in the interacting systems of the atmosphere, hydrosphere and biosphere as a result of the build up of greenhouse gases (GHGs) from atmospheric pollution. Scientific evidence points to the fact that this change is attributed to human activities that have substantially increased the atmospheric concentration of GHGs and have thus enhanced the natural greenhouse effect. Consequently, there is additional warming of the earth's surface and atmosphere, which may affect natural ecosystems and humankind (UNFCCC). Ghana has been and is a signatory to international conventions and treaties recognising and pledging to fight the causes and effects of climate change.

Most African countries, including Ghana, are already feeling various impacts of climate change such as hotter weather conditions, reduced or increased rainfall over time, change in rainfall patterns, flooding, sea surges/ tidal waves, and rise in sea-levels leading to coastal erosion and inundation. Even though the country's contribution to the global climate change problem has been negligible, the impact of climate change on the Ghanaian economy as assessed is substantial (Agyemang-Bonsu et al, 2008). Some impacts are already being felt and there is enough national evidence that further change will occur (ibid 2008).

Historical data for Ghana across the country between 1960 and 2000 clearly show a progressive rise in temperature and decrease in mean annual rainfall in all agro-ecological zones in the country. The average annual temperature has increased 1°C in the last 30 years. Based on this data, it is estimated that temperature will continue to rise, to about 3.9 degrees by 2080. Rainfall is also predicted to decrease, more slowly initially, by 2.8% by 2020 and 18.6% by 2080 in all agro-ecological zones except for the rainforest zone, where rainfall may increase. Available data also show a rise in sea level of 2.1 mm per year over the last 30 years, indicating a rise of 5.8 cm, 16.5 cm and 34.5 cm by 2020, 2050 and 2080 (Minia, 2008). Scientists predict a 1 m rise in sea-level globally by 2100.

Ghana's dependence on climate sensitive sectors such as agriculture and forestry, limited use of irrigation, high fertility rates, higher biomass usage, relatively poor infrastructure, poorer educational opportunities, lower health status and high dependence on favourable climatic conditions for the realisation of good harvest tends to introduce huge instability in the standards of living of the people, thus making the country much more vulnerable (Nelson and Agbey, 2008).

In Ghana, women constitute about 50.5% of the total population and about 30% of heads of households and outnumber their male counterparts in agricultural production. Their socio-economic importance lies in the fact that they control key productive sectors particularly in agriculture. They constitute 52% of the agriculture labour force, contribute 46% to the total GDP and produce 70% of subsistence crops (Ministry of Food and Agriculture, 2002). They play major roles in distribution and production generally, but in particular women are responsible for 85% of food distribution in the country. However, several socio-economic factors affect women's productivity, both positively and negatively, in this sector

1.2 RATIONALE

Improved and sustainable livelihoods for the farmers depend on their knowledge and flexibility in relation to practices and belief systems. Farmers' perceptions about and knowledge of management/ coping strategies in relation to climate change need to be documented to identify strengths and weaknesses as a first stage in amelioration. Gaps undoubtedly exist in farmers' indigenous knowledge about climate change and once these have been identified it might be possible to target positive interventions (for example from scientists and the agricultural extension agents) more appropriately.

Although traditional knowledge has facilitated traditional coping mechanisms at the community level, more inputs are needed to support and enhance these knowledge systems in building resilience to climate change in order to prevent the most severe consequences such as loss of life and destruction of property. Building on/ enhancing traditional knowledge is more efficient than a wholesale import of external systems, but a key problem is the existing lack of documentation of traditional knowledge systems.

Since 2009, negotiations within the UNFCCC have recognised the differential impacts of climate change on women and men and have included gender perspectives in the various thematic areas of climate change. It is therefore imperative to fully understand the gender differentiated impacts of climate change and the existing coping strategies that must be strengthened and supported at the national and community levels. While many interventions have been targeted at men as community leaders in the past, we argue here that, as integral users and shapers of these traditional knowledge systems and with their key contributions to the country's agricultural output, women could enhance both production and their own roles if future help, probably based on scientific and technological upgrading of their knowledge and activities were available. The fundamental concept is that strategic targeting of innovations to women as well as men in communities will improve their contributions to national development and promote national welfare.

The study was undertaken as part of a project "*Building Capacities to Influence Climate Change Policies from a Gender Perspective*" supported by UNIFEM Fund for Gender Equality Catalytic Grants (now UN Women).

1.3 OBJECTIVES

- To collate traditional coping and adaptive practices;
- To identify gaps in knowledge and practices;

- To assess the gender gaps/linkages to the impacts of climate change in the study areas;
- To make relevant recommendations to enhance policy development.

2.0 GEOGRAPHIC AND SOCIO-ECONOMIC FRAMEWORK

Ghana lies between latitudes 4 and 12 degrees N and longitudes 4 degrees W and 2 degrees E. The Greenwich meridian passes through the country, specifically through the industrial city of Tema. It is situated on the west coast of Africa bordered by Burkina Faso on the north, Cote d'Ivoire on the west, on the east by Togo and on the south by the Gulf of Guinea (Figure 1). The total area covered by Ghana is 239,460 sq km, of which 230,940 sq km is occupied by land and 8,520 sq km by water. The country's 539-kilometer coastline is mainly a low, sandy shore backed by plains and scrubs, interconnected by numerous streams and rivers. Ghana's highest point is Mount Afadjato which rises to an altitude of 880m, and half of the country lies below 152 meters (500 ft.) above sea level.

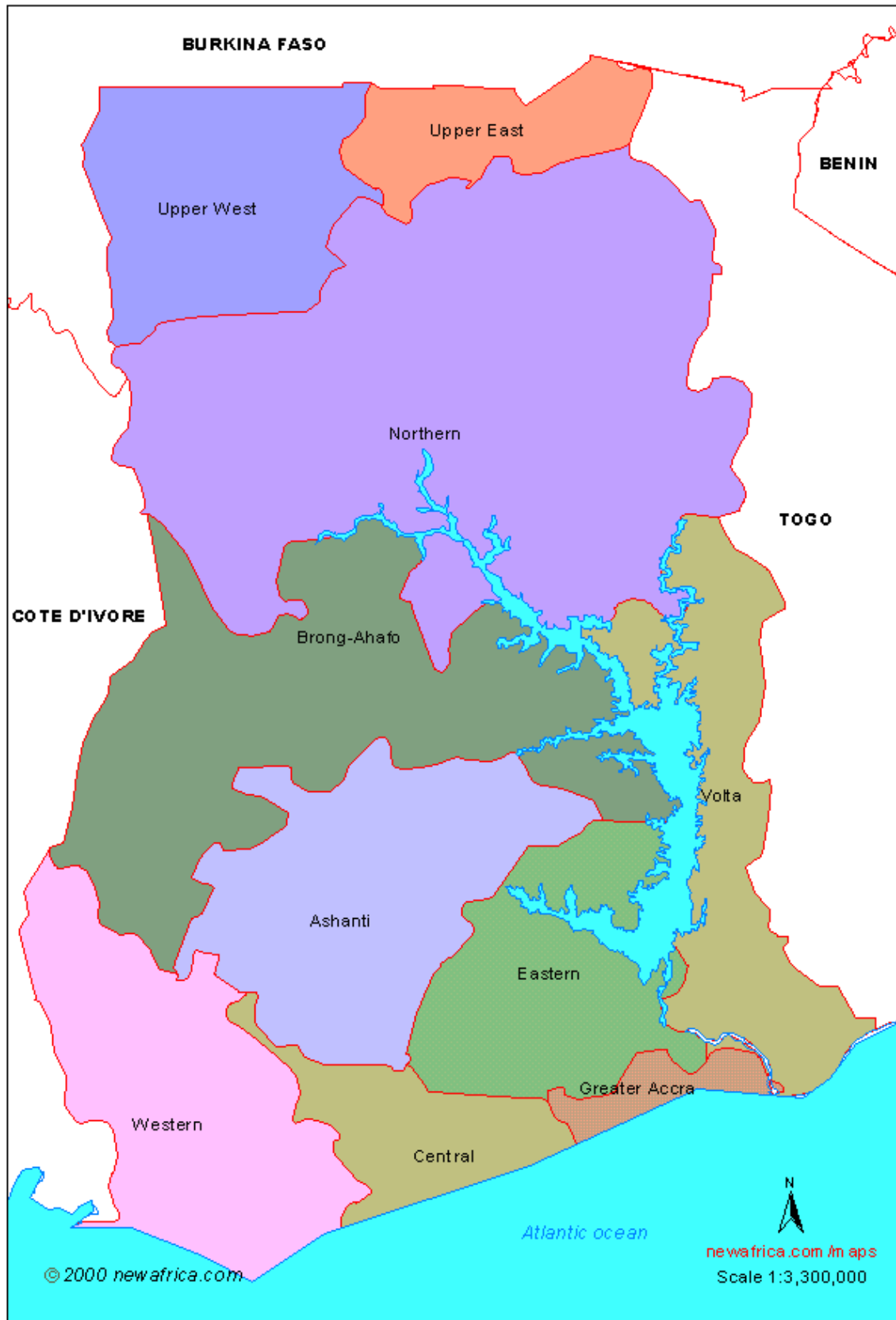
Provisional figures from the 2010 Ghana census indicate that Ghana's population is now 24,223,431. This is made up of 12,421,770 females and 11,801,661 males. Ghana's population has increased by 28.1% since 2000. This gives an inter-censal growth rate between 2000 and 2010 of 2.4 percent. Females outnumber males in all regions. The overall sex ratio is 95 and Ghanaians have an estimated life expectancy of 58 years.

Agriculture is the mainstay of the Ghanaian economy, contributing an average 36% of GDP for the period 2000-2006. The domestic economy is primarily devoted to subsistence agriculture, which accounts for 34% of GDP and employs 60% of the work force, mainly small landholders. Ghana has roughly twice the per capita output of the poorest countries in West Africa and still remains heavily dependent on international financial and technical assistance. Gold, timber, and cocoa production are major sources of foreign exchange. Receipts from the gold sector helped sustain GDP growth in 2006 along with record high prices for Ghana's largest cocoa crop (Ghana's SNC, 2011).

With both population and economy growing, Ghana faces major challenges in providing the required energy (from reliable and sustainable sources) to meet its economic goals. Currently, the main energy resources in Ghana are wood-fuels, electricity and oil products with wood fuels dominating in energy usage (90-95%), 5 – 10% hydro-energy (mainly from dams at Akosombo and Kpong) and less than 1% solar.

Figure 1: Map of Ghana

GHANA ADMINISTRATIVE MAP



3.0 POLITICAL AND INSTITUTIONAL FRAMEWORK

The 1992 constitution of Ghana stipulates that all persons are equal before the law and shall not be discriminated against on grounds of gender, race, ethnic origin, religion or social or economic status. In 1994, the National Development Planning Commission was established by the National Development Planning Commission Act, (1994, (Act 479), usually referred to as "the Commission") to be the national co-coordinating body of the decentralised national development planning system.

These measures were part of the concerted thrust, after Ghana's acceptance of World Bank and IMF help in the 1980s, to devise and implement policies and programmes to increase GNP and raise living standards in the wake of the catastrophic economic decline through the 1970s. Within World Bank/ IMF approved frameworks, several policies were put into place and substantial progress was made towards the realization of macro-economic stability and the achievement of poverty reduction goals by the end of the twentieth century and through the first decade of the twenty-first century.

Currently the medium term national development framework (Ghana Shared Growth and Development Agenda 2010-2013) emphasizes that one of the three main targets under the MDG7 is the integration of the principle of sustainable development into countries' policies and programmes, reversing the loss of environmental resources. In Ghana, many efforts have been made to address environmental issues, both in policy terms and in practice.

Ghana is endowed with abundant natural resources which play a major role in the agricultural and industrial development effort. Ghana's natural resources and environment are changing rapidly due to various issues including climate change impacts.

In the national Medium Term Development Framework environment has a crucial place and is foregrounded in a range of strategies like improved cross sectoral environmental management which includes issues such as:

- Climate change
- Opportunities of REDD+ initiatives
- Strengthened partnerships and participation with stakeholders including women's groups

The current focus on 'environment' is supported by various legal instruments including:

- 1) The National Environmental Policy (NEP) was adopted in 1991 to provide the framework for the implementation of the National Environmental Action Plan (NEAP). The ultimate aim of the policy is to ensure sound management of the environment and the avoidance of exploitation of resources in ways that may result in irreparable damage to the environment. The policy makes provision for maintenance of ecosystems and ecological processes essential for the functioning of the biosphere; sound management of natural resources and the environment; protection of humans, animals and plants and their habitat; guidance for healthy environmental practices in the national development effort; integration of environmental considerations in sectoral, structural and socio-economic planning at all levels.

- 2) The 2010 National Energy Policy recognises that women are key actors in the energy sector in terms of their contact, use and management of renewable energy sources, which at the grassroots, are both used and managed mostly by women. But simply because these energy sources are 'traditional' does not mean that they do not have adverse affects. Women, girls and babies can be affected by negative health impacts from burning wood and charcoal in restricted spaces (kitchens); biomass (primarily wood fuel and charcoal) constitutes 66% of the total energy consumed in Ghana. The policy aims to tease out and mainstream gender concerns in the energy sector, and align them with proper health, safety and environmental standards.
- 3) The Ministry of Women and Children's Affairs, since its establishment in January 2001, has embarked on a number of projects and programmes to promote the rights and welfare of Women and Children and to mainstream gender and children's concerns in all sectors and departments at the national, regional and district levels. The National Gender and Children's Policy is committed to promote the welfare of women and children, their survival, development and protection. However, issues on climate change have not been articulated in this policy.
- 4) The Ministry of Food and Agriculture (MOFA) established the Women in Agricultural Development (WIAD) directorate in 1989, with the objective of improving access of women and other target groups to information on improved agricultural and post-production practices. They also facilitated access to resources towards increase in production, improved nutrition, food security and health. Their activities included transfer of technologies on food production, nutrition and food utilization, food processing, preservation and storage, while still maintaining the home management and other income generating activities embodied in the earlier Women Farmers' Extension Services remit, in order to enhance the production capabilities of women in the agricultural sector. A gender strategy on agricultural development has also been developed by MOFA. However, the impacts of climate change have not been considered in that strategy. There is the need to recognise the importance of placing women at the heart of sustainable development. They are powerful agents for development and therefore should be active participants and decision makers in mitigating the effect of, and adapting to climate change.
- 5) The 1999 National Land Policy aims at the judicious use of the nation's land and all its natural resources by all sections of Ghanaian society in support of various socio- economic activities undertaken in accordance with sustainable resource management principles and in maintaining viable ecosystems. The objectives of the policy include the following:
 - Facilitate equitable access to and security of tenure of land;
 - Protect the rights of landowners and their descendants from becoming landless or tenants on their own lands.

6) Current and Future Initiatives

Ghana is also developing a National Climate Change Adaptation Strategy (NCCAS) which aims to contribute to the mainstreaming knowledge about climate change and disaster risk reduction into national development planning as well as to facilitate effective adaptation across sectors and at various planning levels. Some of the key principles which guided the NCCAS include:

- Adaptation policies are to be addressed as part of a broader context of National Development Policy Framework;
- Stakeholder participation is central to ensure national ownership;
- Promotion of sustainable development and poverty reduction are focus areas of the adaptation strategy;
- Long term impacts of climate change as the principal parameters for considering adaptation;
- Gender sensitivity and reduction of vulnerability are extensively adopted; and the plans should be cross-sectoral and integrative but not necessarily sector wide.

In 2011, the IUCN and WEDO launched an initiative to develop Gender and REDD+ road map in Ghana. This is the first global initiative to address country-specific gender considerations in REDD+ processes. This initiative involved multi-stakeholder processes, which brought together representatives of women's organisations, gender experts and national level policy-makers to discuss country-specific gender issues and propose actions that would lead to gender-sensitive REDD+ national processes. The road maps were plans of action that would identify objectives within the three phases of REDD+ (readiness, implementation and consolidation) and the steps to achieve those objectives within the national context.

Ghana is also developing a National Climate Change Policy Framework with three objectives:

- Low carbon development growth;
- Effective adaptation to climate change; and
- Social development.

Under the social development aspect, emphasis would be placed on the impacts of climate change on the poorest, with implications for poverty, equity and gender issues.

4.0 LITERATURE REVIEW

4.1 CONCEPT OF CLIMATE CHANGE

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as change of climate that is observed over long periods of time, attributed directly or indirectly to human activity, above that caused by natural climate variability (UNFCCC, 1992). However, according to IPCC (2001) climate change refers to any change in climate over time, whether as a result of human activity or due to natural variability. Schneider et al. (2007) define an impact as a specific change in a system caused by its exposure to climate change. This exposure may be judged as harmful or beneficial. The degree to which these systems are susceptible to and unable to cope with the adverse impact of climate change is referred to as vulnerability (ibid 2007).

4.2 CLIMATE CHANGE IMPACTS IN GHANA

We have already suggested that Ghana has experienced/ is experiencing adverse impacts from climate change: the changes affect sectors, places and people differentially depending on their levels of vulnerability defined in both physical and socio-economic terms. Ghana's vulnerability to climate change derives largely from the effects of drought, floods, and sea erosion.

4.3 GHANA'S VULNERABILITY TO CLIMATE CHANGE

Vulnerability in all areas of Ghana has varied impacts because we have to take into account both the physical (actual changes in climate) factors and the nexus of social, political and economic factors relevant in different communities throughout the country which means that some groups in some communities can cope better and others are more adversely affected. More vulnerable in this context means a greater inability to cope and adapt positively to changes, whether the vulnerability is largely the result of physical climatic changes and/ or socio-economic barriers to coping. The vulnerability of a society is influenced by its development path, physical exposures, the distribution of resources, prior stresses and social and government institutions (Adjer et al. 2007).

In Ghana each ecological zone has peculiar physical and socio-economic characteristics that define their sensitivity and resilience to climate change impacts. Relative wealth or poverty is a good indicator of potential resilience, while location and occupation also interact and cross cut to determine sensitivity, again, linked back to relative wealth. Poverty reduces the capacity of people to meet climate challenges and maintain sustainable livelihoods. Poverty in Ghana is highly spatialised and correlated with ecological conditions. Generally, rural areas are home to the bulk of Ghana's poor, but the exception here is the coastal savannah where the capital, Accra, and other large towns are located. In rural areas the majority of people are dependent on the climate for their livelihoods (agriculture and associated activities) and hence their greater potential vulnerability to change in climate. Already dry areas, such as the northern and coastal savannah, are extremely vulnerable to even less rainfall, but even those in the less drought prone areas are experiencing problems from the unpredictability of weather systems: too much rain at the wrong times; too little rain at

others; and floods. Slight changes in rainfall have serious consequences for those in the transition and forest zones who grow cash crops such as cocoa, pineapples, mangoes, papaya (NCCAS, 2010). The problems that these physical conditions engender will tend to be exacerbated in poorer households (ibid 2010).

Environmental change as a consequence of climate change inflicts harsh and extreme environmental conditions upon rural smallholder farmers and therefore has direct implications for creating unsustainable livelihoods. Farmers have their investments washed down the drain by floods and droughts almost every second or third year, especially in the northern savannah zone. High temperatures affect crops adversely, water availability and the productivity of farmers (ibid 2010).

Flooding has been more severe in the sprawling urban areas of coastal Ghana than in the inland towns largely because of increasing frequency of storms and poor urban planning (e.g. restriction and blockage of drainage). The coastal savannah is the site of serious erosion resulting from rising sea levels. Indigenous fishing communities are affected the most in terms of lost of physical assets and livelihoods. Salt water intrusion as a result of rising sea levels, affects ground water sources (such as boreholes), currently supplying the bulk of rural inhabitants along the coast. Most wells dug in Accra contain varying amounts of salt that renders the water unsuitable for drinking (ibid 2010).

The severity of climate change impacts are felt mostly by poorer groups that depend on natural resource-based activities and living in marginal environments. The socio-economic groups affected most by climate change include small-scale farmers (both women and men), livestock operators, fishermen and fishmongers, slum dwellers, and migrant farm workers. These groups are vulnerable largely because of their lack of capital and their position is worsened due to institutional bottlenecks, legal frameworks, poor capacities and market imperfections. These non-climate drivers of vulnerability define the access patterns of different people in different places to productive resources which can build resilience and adaptive capacity (ibid 2010)

4.4 COPING AND ADAPTING

Short-term responses to a decline in food availability and income in abnormal years are defined as coping or coping strategies, while longer-term or permanent changes in the ways in which food and income are acquired are defined as adapting or adaptation strategies, according to the work of Davies (1993).

4.5 CONCEPT OF GENDER

Gender has been generally described as socially constructed, culturally variable roles that women and men play in their daily lives (Meena, 1992). It also refers to behavioural expectations that society has of women and men based on sex (Ipinge and Williams, 2000). However, there is a distinction between concepts of gender and sex. Gender identities and roles are constructed in society but are not fixed, not universal and do change over time. Sex is biological and sex roles are fixed and universally similar (Meena, 1992 and Ipinge and Williams, 2000).

The social relations and expectations of behaviours and roles of women and men in society are gender roles' (Whitehead, 1979). Gender does not simply refer to women or men, but to the way their qualities, behaviours and identities are determined through the process of socialisation. These roles and responsibilities are culturally specific and can change over time (UNDP, 2003). The different roles are influenced by historical, religious, economic, cultural and ethnic factors. As women and men are defined in the weave of specific social fabrics, the relation they share constitutes what is known as gender relations (ibid 2003).

According to Meinzen-Dick and Zwartveen (1997), the links between gender and community have direct implications for the efficiency of use and sustainability of natural resources, as well as for the livelihoods of people who depend on those resources. The links thus become relevant for policy in the context of the current emphasis on devolution of resource management. The differences and inequalities between women and men influence how individuals respond to changes in resource management. Understanding gender roles, relations and inequalities can help explain the choices people make, and their different options.

4.5.1 Gender and sustainable development

Women have a crucial role in the achievement of sustainable development for the years ahead. However, Norgaard and Howarth (1991), caution that incorporating environmental measures in development policies will not bring sustainability itself unless the present generation is committed to transferring to women and communities sufficient resources and capital assets to make development sustainable. The Human Development Index (2001 and 2007/2008) has shown that there is a strong relationship between human development and income.

4.5.2 Gender in the Ghanaian Context

In the Ghanaian context, home labour is a "pervasive component" of women's time allocation (Higgins and Alderman 1997) and, in developing contexts more generally, women's productive and reproductive roles, (the latter, effectively, home labour) are often focussed around environmental resources such as land, water, and forest products (Ardayio-Schandorf and Kwafo-Akoto 1990). In the case of forest products, women often bear the primary responsibility for their collection (Ardayio-Schandorf and Kwafo-Akoto 1990; Bour, 2004; Crow and Sultana 2002), an often time-consuming set of activities which decrease the availability of time to be spent elsewhere like market activities, agricultural production, cooking and other reproductive tasks (Kumar and Hotchkiss 1988). In the longer term, too, these foraging responsibilities may have an adverse impact on women's health (Buor 2004, Higgins and Alderman 1997)

4.5.3 Gender, Vulnerability and Adaptation to Climate Change

Adaptation is defined as adjustments made in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects or impacts. The IPCC Fourth Assessment Report confirms that even if the world makes a significant reduction in greenhouse gas emissions, the lag in terms of the climate system means that we are faced with decades of continuing climate change because of the emissions already put into the atmosphere. Adaptation is therefore a must and a necessary complement to measures for reducing greenhouse gas emissions. Adaptation is the principal way to deal with the unavoidable impacts of climate change. It includes a complex range of activities needed to manage risks, adjust development, including economic, environmental and socio-cultural activities, to reduce vulnerability of both local and national

economies, populations and ecosystems to the impacts of climate change in order to provide greater certainty to national development aspirations and growth.

Adaptation aims at moderating the adverse effects of climate change by reducing vulnerability to climate effects through a wide range of interventions. It is now becoming a central plank of climate policy due to the increasing engagement of the development community, particularly through emphasising the differentiated nature of impacts across the world and within societies. Adaptation has been framed both as an equity and rights issue. According to the *IDS Bulletin* (date), adaptation will be ineffective and inequitable if it fails to learn from and build upon an understanding of the multi-dimensional and differentiated nature of poverty and vulnerability.

The concept of vulnerability has been used in association with those of poverty and sustainable livelihoods stemming from work on hazards and disasters (Prowse, 2003). Studies on natural hazards suggested that human's social, economic, political and psychological circumstances mediate how they experience changes (Bradshaw, 2004). Therefore, the concept of social vulnerability has to take into account the finely graded differences among people's life situations. We suggested earlier that 'ability to cope'/ adapt depends on a range of socio-economic factors. Following Babugura (2005), Adger (2006) and Bradshaw (2004), this study defines vulnerability as the ability or inability of individuals, or groups of people to respond, cope, adapt or recover from impacts of climate change on their livelihoods.

One of the key underlying concepts in the climate change/ development debates is gender, and in particular the multiple roles played by women, many of which involve environmental management (Dankelman and Davidson, 1988). According to Barrett and Brown (1988) women in Africa are substantial users of environmental resources. Through their roles in production, reproduction and community management they have responsibility for environmental use, for redistribution of environmental resources and potentially for the destruction or conservation of these resources.

Meinzen-Dick and Zwartveen (1997) state that as users of resources, both women and men have interests, needs and priorities in respect to their management. But socially constructed versions of gender mean that women and men, as both users and managers of resources, often have different knowledge and skills and ranges of access to resources to offer.

A typical rural woman's schedule involves looking for water and firewood; producing both raw and cooked food; care responsibilities for children and the elderly and sick. Local gender divisions of labour allocate heavy work like land-clearing to men, and men may also plant, weed and harvest, but men do not have regular reproductive responsibilities, like cooking and care, so have more free time after the end of the farming day.

Perceptions of women and the work they do have suffered, relative to those of men, in the past because, men have been seen as owners and controllers of natural resources and community leaders. Since the 1960s gender aware studies have emphasised both women's use and control of resources, albeit, perhaps, informal, but women of today must be seen as fit and competent managers of these resources, be seen as full and active participants in their communities' livelihoods, rather than as helpless victims of environmental changes. One good starting point might be a focus on improved water supply, saving women's time and energy on one

hand and decreasing the possibility of water-borne infections on the other (Venkateswaran, 1995; Kabonesa and Happy, 2003).

4.6 EFFORTS AT PLACING GENDER IN NATIONAL DEVELOPMENT

The commitment of the Ghana Government to put gender and children's issues at the fore of the national development agenda was manifested in the establishment of the Ministry of Women and Children's Affairs. Significantly, the Minister's position as a Cabinet Minister is to ensure that government gives serious consideration to issues relating to gender and children. The Ministry, since its establishment in January 2001, has embarked on a number of projects and programmes to promote the rights and welfare of women and children and to mainstream gender and children's concerns in all sectors and departments at the national, regional and district levels.

4.6.1 Water, Women and Climate Change

Climate change can affect the volume of water, water temperature and water quality of each type of water resource (rivers, lakes, dams and groundwater). These changes will influence natural ecosystems, water utilisation systems and water demand. Any changes in the volume of water or water quality also have serious implications for other sectors, for example, agricultural production, natural ecosystems, protection against disasters and health. Perceptions of and responses to water resources management, like other aspects of social life, are gendered. Understanding gender roles, relations and inequalities can help explain the choices people make and their different options.

Cleaver (1997) argues that a focus on men's and women's priorities separately fails to recognize the need to balance water use priorities within a household. Men, mainly, need water outside of the domestic context, for livestock and for, perhaps, building activity, whereas in the rural areas particularly, it is the women's responsibility to make sure that there is water to wash, cook and also for other livelihood activities. Women's commercial activities, such as processing palm fruits into oil, batik, tie and dye processing, also require significant amounts of water. In some areas (ibid) there are informal sharing arrangements that strive to balance gendered demands for water.

Even when water is relatively plentiful, since it is women and children who are responsible for fetching it, then they are the ones who might be exposed to water borne infections such as guinea worm, onchocerciasis and schistosomiasis. But, in times of water scarcity, women and children are further affected since they may travel longer distances in search of water, adding fatigue and greater possibility of exhaustion to the physical risks.

4.6.2 Energy, Women and Climate Change

The roles of women in the energy sector are very significant since in rural areas in particular, biomass in the form of fuelwood, is the major energy source, and women are largely responsible for its finding, transporting and use in the household. Utilisation of biomass as an energy source contributes greatly to deforestation in Ghana, especially where it is used for the production of charcoal for urban areas and institutions. Currently, there is much emphasis in studies on conservation of this source of energy by women.

In most households where firewood is the main cooking fuel, traditional moulded hearths or the 3-stone stove are used. Studies have shown that the hearth/ stove is highly inefficient in terms of focussing heat and its level of smoke emission into the cooking environment is detrimental to the health of the users, mainly women and children, leading to a high incidence of eye, chest and respiratory diseases for women and children in rural areas where firewood is the main fuel source. The situation is no different for the urban poor who also rely on biomass for their energy needs. There are thus three main problems associated with the open fire hearth or stove used by most women in the country. These are:

- Relatively high fuel wood consumption, with potential impacts for deforestation;
- Health and environmental effects from smoke particles; difficulty in sitting close to the stove to cook due to excessive heat transfer from the stove to the environment ;
- High workload of women and children who collect firewood.

4.6.3 Fisheries, Women and Climate Change

The land area of the coastal zone of Ghana defined as the area below the 30 m contour covers about 7% of the total land area of Ghana and extends for 565km. It is home to 25% of the population of the country (including urban areas and the capital). The zone is divided into three: the sandy East Coast (149 km) and West Coast (95 km) on the extremities of the zone, and the Central Coast between the two (321km) (EPA 2000).

The East Coast stretches from Aflao in the east to Prampram, whilst the West Coast stretches from the country's border with La Cote d'Ivoire on the west to the mouth of the Ankobra River west of Axim. Between these two sandy segments of the coastal zone lies the Central Coast stretching from the Ankobra River in the west, to Prampram in the east. The Central Coast comprises mainly rocky beaches interspersed with short sections of sandy beaches between 2-10 km long (ibid). The Central Coast is the most urbanised section.

In the event of rise in sea level, low lying sandy coastal areas, in particular, the Volta delta will be profoundly affected. The expected sea level rise will also result in the following:

- Direct inundation (or submergence) of low lying wetland and dry land areas;
- Erosion of soft shores by increasing offshore loss of sediment;
- Increases in salinity of estuaries and aquifers;
- Raised coastal water tables; and
- Exacerbated coastal flooding and storm damage.

According to the 2000 EPA Report these impacts will in turn affect coastal habitats, biodiversity and socioeconomic activities. There will be changes in water quality which will have adverse effects on most freshwater fish; valuable agricultural lands will be inundated, thus depriving women of their livelihoods in both farming and fisheries activities. Certain beach facilities will also be endangered and some groundwater resources polluted with salt.

The preliminary assessment of the impacts of rise in sea level the (EPA, 2000) showed that about two-thirds of the total land area potentially at risk of flooding and shoreline recession in Ghana lies in the East, with the remainder lying on the West Coast and a few sections of sandy beaches within the Central Coast. A total of

1,110 km² of land area may be lost as a consequence of a one-metre rise in sea level. The population at risk has been estimated at 132,000, most of them within the East Coast.

A rise in temperature will also have a negative effect on productivity in areas such as lagoons where salinity will increase and young fish will die. On the other hand, warming-induced changes in current patterns may also bring more nutrients to the surface and provide more food for the fish (IPCC 1996). The Intergovernmental Panel on Climate Change (2001) predicted changes in the abundance, distribution and species composition of some fish populations: some fisheries will collapse whereas others may expand.

The fisheries sector seems to be under represented in development policies and plans of most countries. However, the two main sources of quality protein available in Ghana are fish and livestock. In Ghana and many African countries, the popular option for protein is fish, which is relatively available throughout the year and relatively cheap. Fish provides the Ghanaian consumer with about 60% of their animal protein (DFID, 2004). Many women in the coastal zones are dependent on fish, its processing, sale and transformation, for their livelihoods. Men usually go out to sea but when the boats land, women, and sometimes children, take over the purchasing, storage, processing and marketing of the fish. Even though fishing is undertaken on a continuous basis in Ghana, the significant bumper harvest occurs between the months of July and September. Post-harvest fisheries activities provide a wide range of full-time and seasonal livelihood opportunities for many women and any decline in this work, whether through the impacts of climate change or others, will have adverse effects on the livelihoods of women who are already living on the margins of poverty (ibid 2004).

A recent study in the Central Region (Okorley *et al*, 2006), found that most women involved in fisheries are poor and tend to manage large households. More to the point, fish processing is now the province of an aging population of women and there is little evidence that younger women want to work in the business.

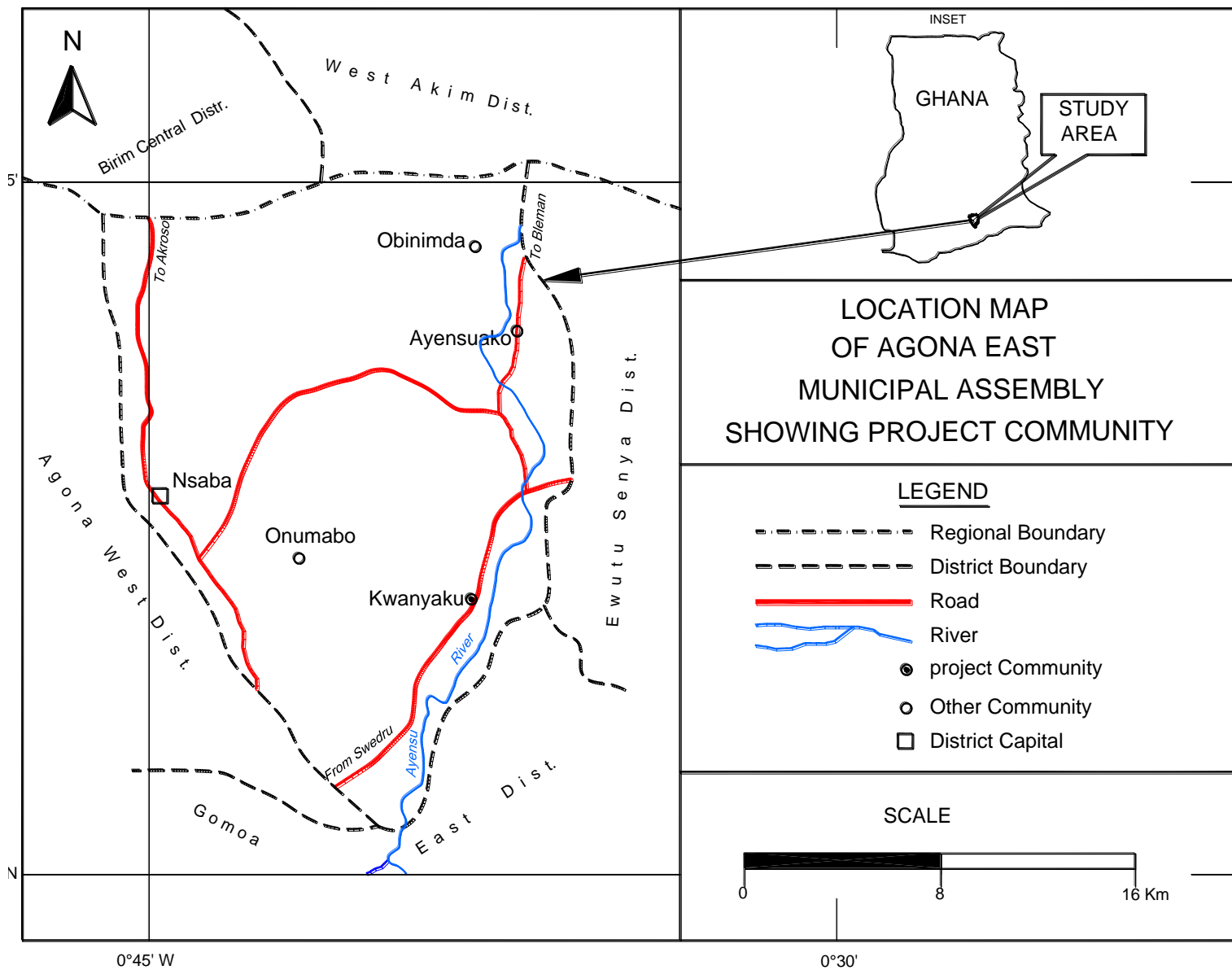
With the impacts of climate change, women who play an important role in the fishing industry either as intermediaries or through direct involvement with fishermen will see their income decrease significantly. As income levels for many involved in the fisheries sector decline (with the changes in the seasonality of fisheries and increased competition over resources from global players, so indebtedness is on the increase. In some cases this has led to the negative livelihood strategy of taking children from school and forcing them to work with their families.

Taking into account the importance of the fishing industry to the economy, climate change impact will mean job losses and the increase in the price of fish generally, although local incomes from fishing will inevitably fall.

5.0 STUDY AREAS

The research was carried out in two different locations within the country, Kwanyaku in the Central Region and Keta in the Volta Region.

Figure 2: Map showing Kwanyaku



5.1 KWANYAKU

Kwanyaku is in the Agona East District of the Central Region, recently created from the division of the former Agona District: it therefore is in the process of developing its profile. The estimated population of the district stands at 85,339, (43,864 females, 51.4% and 41,475 males, 48.6%) (AEDA DWSP Data Collection Report, 2009).

There are efforts to manage population growth in spite of a declining growth trend (2000 Census). Local health centres promote family planning programmes sponsored by the MOH. Currently most popular family planning aids are oral, injectables, spermicides and condoms.

5.1.1 Climate

The district falls within the wet semi-equatorial climate zone and has a bi-modal rainfall pattern, with maxima occurring in May/June and September/October. Annual rainfall ranges between 1000mm - 1400mm, which allows for two main growing seasons. The dry-season lasts from December to March and March/ April has the highest mean monthly temperature (33.8°C). August has the lowest mean monthly temperature (29.4°C).



Figure 3: Kwanyaku Community



Figure 4: Farm in Kwanyaku

5.1.2 Economic Activity

Farming and trading are the major activities in Kwanyaku, and the main crops are cocoa, maize, cassava, fruits and vegetables. Traditional farm management practices, such as slash-and-burn (with reduced fallow periods and reduced crop rotation cycles because of population growth) and the absence of agro-forestry practices among others have resulted in considerable arable soil erosion.

The share-cropping arrangement under the existing land tenure systems within this area is either 50:50 (Abunu) or 40:60 (Abusa) and both are common.¹ This has promoted solid social bonds and economic ties between migrant tenants and their indigenous landlords. It also makes it easier for tenants to acquire land for farming.

5.1.3 Existing Water Situation

The main sources of water in the District are pipe- borne and from boreholes and wells. The remaining population depends on untreated water from streams and rivers.

5.1.4 Economy

The Agona East District has economic potential, both natural and man-made, but although a variety of crops are grown and there is a range of small commercial activities, its market infrastructure has not been seriously developed. This lack of development is at least in part due to competition from the adjoining town Agona Swedru, where there is a much greater degree of commercial activity. Agona East produces large quantities of cassava, maize, plantain, cocoyam and vegetables. which are marketed either locally or transported to other bigger markets like Agona Swedru or Bawjiase. Traditional cash crops such as cocoa, palm oil and coffee are also produced.

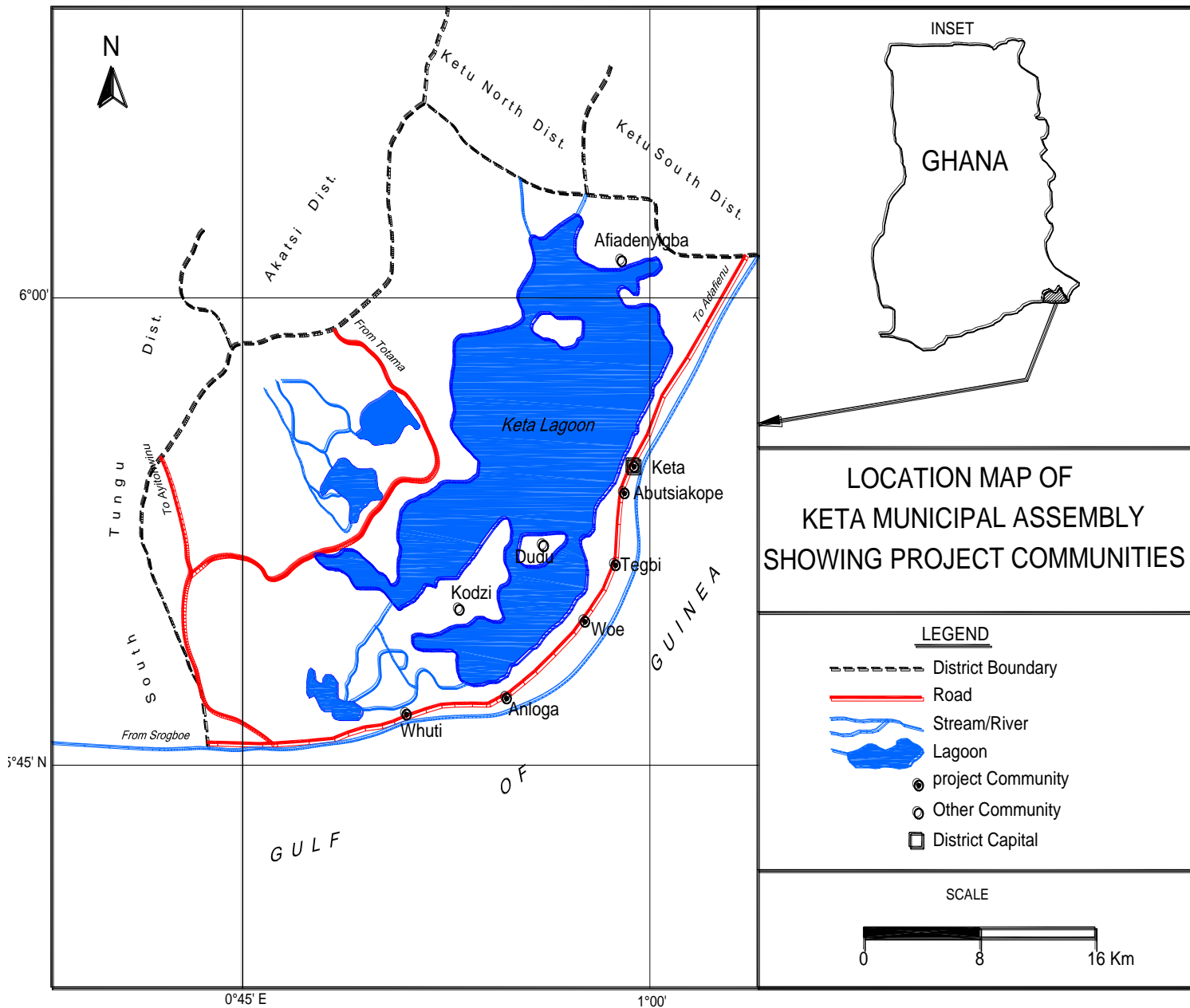
5.1.5 Environmental Situation

Waste disposal and sanitation are problematic in the district. Drainage is poor and there has been inadequate infrastructural investment in toilet facilities. In Kwanyaku specifically, there are no designated refuse disposal points and so people dump their waste seemingly indiscriminately. As the town is relatively small there have been no overarching water and sewerage/ drainage plans in the past. Individual houses and quarters thus dispose of grey water and household waste haphazardly in gutters surrounding houses, leading to unsanitary conditions and pollution in most areas.

The illegal activities of chain-saw operators, charcoal producers and firewood merchants have resulted in deforestation since the fuelwood related activities are not based on sustainable exploitation of forest resources and this is rapidly leading to a threat to ecological stability and sustainable environmental development.

¹ Abunu means that the owner of the land and the tenant, the share-cropper, split the profits 50:50, while in Abusa, the split is 40:60

Figure 5: Map Showing Keta



5.2 KETA MUNICIPALITY

5.2.1 Physical Characteristics

Keta is the capital of the Keta Municipal District which is made up of 18 smaller administrative districts in the Volta Region. The district is on the coast, east of the Volta estuary, about 160km to the east of Accra, off the

Accra-Aflao main road. It shares common borders with Akatsi district to the north, Ketu district to the east, South Tongu district to the west and the Gulf of Guinea to the south.

Figure 6: Keta Lagoon



Out of the total surface area of $1,086\text{km}^2$, approximately 362km^2 (about 30%) is covered by water in various forms. The largest body of water is Keta Lagoon, which is about 12 km at its widest section and 32km long. Several streams and distributaries of the Volta drain into the lagoon basin. The prevalence of so much water means that there are severe constraints on land-based development in the district. However, fishing and water transportation potential exists.

The Municipality experiences a double maximum rainfall pattern. The major rainy season is between March and July while the minor one begins in September and ends in November and these coincide with the main and minor cropping seasons. The high average temperatures (about 30°C), coupled with low relative humidity, promote high evapo-transpiration. Thus, the total amount of rain is relatively low. Apart from this, the pattern shows a declining trend and the distribution over the year is highly uneven.



Figure 7: Keta Community



Figure 8: Keta Lagoon and the Sea

5.2.2 Climate and Vegetation

The Municipality has an annual average rainfall of less than 1,000mm, but this average hides differences between the north and the coast: at the coast mean annual rainfall is about 800mm. The district is thus one of the driest along the coast of Ghana. The entire municipality falls within the coastal savanna zone. However, four vegetational zones can be discerned. In the northern part there are tall grasses and the landscape is interspersed with medium sized trees at quite high density. The mid-section has shorter grasses and trees and there are occasional “Pamira” palm and baobab trees. The south-western part is characterised by mangrove plants along the Volta estuary and tall grasses, used for fuel and mat/hat weaving respectively. The south-eastern part along the coast from Whuti has short grasses and several neem trees. Most of the coconut trees along the coast have been affected by the Cape St. Paul Wilt disease. This has had a major influence on the rainfall pattern in the Municipality and has caused economic problems for coconut producers and processors.

5.2.3 Water Transport and Links

Lagoon transport, though important, is poorly developed. Non-motorized local canoes are used to transport goods and people across the lagoons. A serious problem is the seasonal fluctuations in the water level which cause problems for embarking and disembarking and which render movement very slow and cumbersome. The silting up of the lagoon further exacerbates the reduction in water level.

5.2.4 Environmental Situation

The Municipality faces a number of problems with its natural environmental conditions. The Savietula-Dzita-Anyanui area is facing devastating severe sea erosion, although similar problems in the Keta-Horvi have been solved by a Sea Defence Wall.

Because the Keta Lagoon is largely river fed it is dependent on rainfall and changes in the human uses of water upstream. In the dry season the Lagoon shrinks significantly, and when there is severe drought it may recede over one kilometre. All of the above-mentioned factors, rainfall and human use upstream, silt deposits and high evaporation, contribute to the irregularity of the Lagoon's size.

Table 1: Location and Category of Environmental Degradation

AREA	CATEGORY OF DEGRADATION
Keta – Heluvi	Sea Erosion
Anyanui – Dzita	Depletion of Mangrove
Keta lagoon basin, and creeks	Silting of lagoons and creeks.
In most settlements especially Anyako, Keta and Afiadenyigba.	Indiscriminate domestic liquid and solid waste disposal.
Northern sections of the Municipality	Bush fire and shifting cultivation.
Cape St. Paul and surrounding areas.	Depletion of coconut trees along the coast due to the infestation of the Cape St. Paul wilt disease.
At the littoral	Water pollution due to seepage of agro-chemicals, household and human waste into underground water sources.

SOURCE: By DPCU Survey in 2000

The problems faced by the people in the Keta Municipality are set out in Table 2

Table 2: Statistics of Disaster, Causes and Effects

DISASTER TYPE	VULNERABLE AREAS	CAUSES	EFFECTS
Run off Flooding	Bleamezado, Vodza, Tregui, Benadzi, suipe, Anloga, Anyako, Seva, Lawoshime, Azanu, trekume, Agorvinu, Keta.	Low-lying areas with wrong placement of structures. Blocked drains, whether silt or waste	Flooding of farmlands and destruction of crops. Displacement of people and property damage.
Tidal Waves/Coastal Erosion	Kedzi, Horvi, Vodza, Adzido, Keta, Dzita, Atiteti and Kporkporgbor.	Sand winning and erosion along the coasts.	Displacement of people.
Army Worm	Azanu, Akplorfudzi, Atiavi, Hatorgodo, Lawoshime, Aveli, Agorvinu, Benadzi, Tregui, Bleamezado, Trekume, Mamime, Devenu	Erratic Rainfall	Destruction of crops and vegetation.
Domestic Fires	Entire Municipality	Human activities i.e. Unattended/ Forgotten sources. (fires used to clear paths/roads during the dry season).	Destruction of property.
Rainstorms	Entire Municipality	Improper siting and usage of inappropriate building materials and techniques	Destruction of Houses.
Disease outbreaks	Entire Municipality. Most serious at Anlo-Afiadenyigba.	Improper dumping and disposal of waste	Cholera, malaria outbreaks.

5.2.5 Farming

The declining soil fertility in the district means that people use more manure and chemical fertilisers, and water for irrigation. This has caused ground water pollution and increased salinity of soils. The increased pressure on land, through population growth and shrinkage of available land for cultivation, particularly along

the coast, has left the soils fragile and more susceptible to erosion.

5.2.6 Fishing

Traditional fishing techniques were appropriate and largely sustainable in the past. Now, however, with more competition, larger markets and greater costs involved, fishermen increasingly use agro-chemicals, explosives (TNT) and unauthorized fishing nets. This has led to the pollution of the water bodies and the depletion and extinction of some fish species.

5.2.7 Wood Cutting

This is an important economic activity. The intensified harvesting of red and white mangroves growing around Anyanui, Atorkor and Salo for domestic and commercial use has further aggravated the soil erosion problem. Furthermore, the habitat and breeding sites of fish and bird species have been destroyed.

5.2.8 Coastal Sand-winning

Sand winning, the removal of sand for construction and other uses, has long been practised along the coast, but recent major increases in the tonnages taken, especially around Dzita, Atorkor, Dzelukope, Tegbi and Woe, have significantly exacerbated the effects of the sea erosion. The beauty of the coast with its dunes and sandy beaches, with great potential for tourism, has also been adversely affected.

5.2.9 Built Environment

Through the twentieth century sea erosion has been so severe that numerous buildings of all kinds were inundated. Among the historical sites affected are the Danish Fort Prinzenstein and Cape St Paul lighthouse. Their rescue, restoration and maintenance could provide a significant attraction for future tourism.

Our chosen study districts thus exemplify different ranges of environmental and physical characteristics and our study provides ample evidence of the effects of recent changes in environmental conditions, whether directly man-made (drainage, pollution because of sewage) or from the impacts of climate change.

6.0 METHODOLOGY

6.1 DATA COLLECTION

Reconnaissance visits were made to the sites. During the visits we interacted with the chief or opinion leaders in Keta and Kwanyako. The project was introduced to them and permission sought to interact with the communities members. Also, we took the opportunity to discuss the history and background of the sites. The result was favourable.

Two types of studies were done a qualitative and quantitative study. For the qualitative research approach we used focus group discussions and key informant interviews. Household surveys were done where 200 people were interviewed using structured questionnaires, 100 people from each study site. To strengthen findings from the quantitative approach, focus group interviews and key informant interviews were done at each site. 3 groups were interviewed at each site which included group of men only, group of females only and the youth group. Personal interviews were also done with key informants like chiefs, opinion leaders and club leaders.

For the focus groups we ensured that specific groups of natural resource users within a certain age group were in each group interviewed. This was done to motivate group discussion. Questions were interactive and participants were free to talk with each other or ask questions at any time. The number of participants per group varied from 15-35. Occupations included the fishermen, fishmongers, farmers, students and traders.

Participants were gathered in the community's meeting room and discussions were started with icebreakers in the form of stories or physical activity. This was followed by giving an explanation of the purpose of our visit, the objectives of the group discussions and a brief overview of climate change and gender issues. Using an interview guide questions were discussed guided by the researchers as facilitators. Each session lasted 3-4 hours and participants were refreshed.

Figure 9: Focus Group Discussions (Keta women, men and youth)



Figure 10: Focus Group Discussions (Kwanyaku women and men)



6.2 LIMITATIONS

Participants brought up the issue of research fatigue. In their opinion they have participated in various research activities but their concerns have not been met. They were reluctant to participate in this project due to prior experiences. We had to sensitize them and promise follow-ups after this initial project in-order to get them to fully participate.

6.3 DATA ANALYSIS

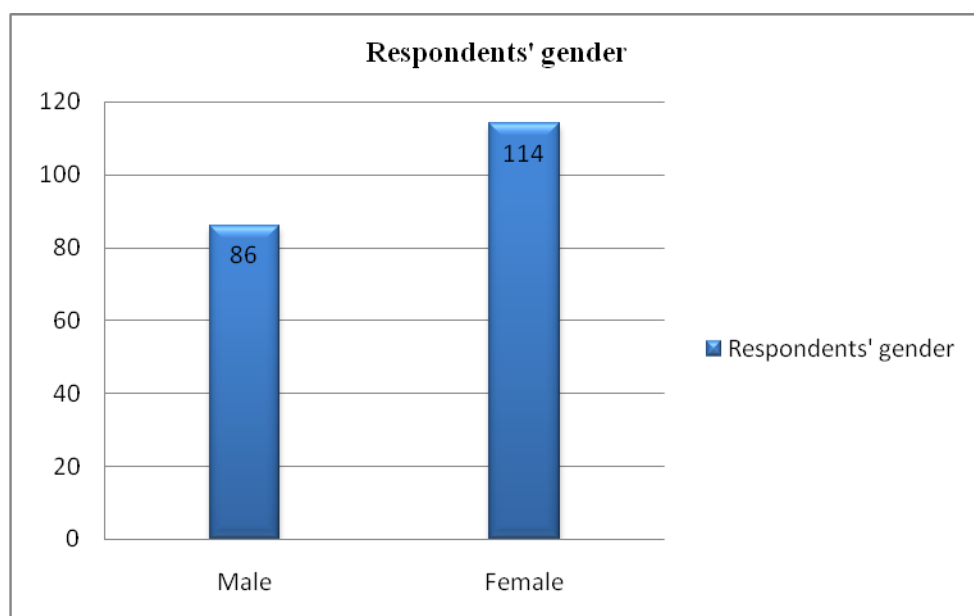
Thematic analysis was used to collate key ideas from the qualitative interviews. These ideas were later compared with findings from the surveys. The analysis from the survey was done using SPSS version 16.0 and it was mainly descriptive.

7.0 MAIN FINDINGS OF THE STUDY

7.1 QUANTITATIVE ANALYSIS

We interviewed 200 people in all, 114 (57%) women and 86 (43%) men: the absence of men is explained by their working away from the communities.

Figure 11: Demographic Characteristics: Sex



Forty-five percent were between 15-30 years;) and only 5.5% were above 60 years. In terms of marital status: 100 (50%) were married; 85 (42.5%) were single; 8 (4%) were divorced; and 7 (3.5%) were widowed. Just over 90% had some education: only 18 (9%) had not had any formal education. Of those who had been educated 101 (50.5%) had been educated to the SSS level and 25% had received some form of tertiary education. The vast majority were Christian-- 175 (87.5%). Majority of the ethnic groups were Akan 94 (47%) (mainly in Kwanyaku) or Ewe 84 (43.5%), (mainly in Keta), as would be expected. Overall, at the two sites, most respondents (137- 68.5%) were engaged in unskilled employment, although 63 (31.5%) had skilled jobs. These overall figures mask a slight gender skill difference: 33.7% men and 29.8% women were categorised as skilled, the remainder, in each case being unskilled. The main income generating activities identified were farming, fishing and trading. Fishing is more prominent in Keta whilst farming is more prominent in Kwanyaku.

These earnings declared were generally low and this was apparent in the appearance of respondents' houses. We should state here, however, that answers to questions about income are notoriously unreliable as people are both loath to divulge their incomes, and in many cases, simply do not know total incomes from a range of sources but housing stock and lifestyle implied that both communities were relatively poor. The modal income of households was declared as over Gh₵ 150 per month, but individuals estimated incomes differently: 16.3% male and 15.8% female participants estimated amounts less than Gh₵50; 30.2% male and 36.0% female respondents estimated between Gh₵50 and Gh₵90; 1.2% male and 0.9% female participants estimated Gh₵100-150; 45.3% male and 40.4% female participants estimated over Gh₵150, although 3.5% male and 1.8% female respondents said they had no income.

Figure 12: Main Income Generating Activities

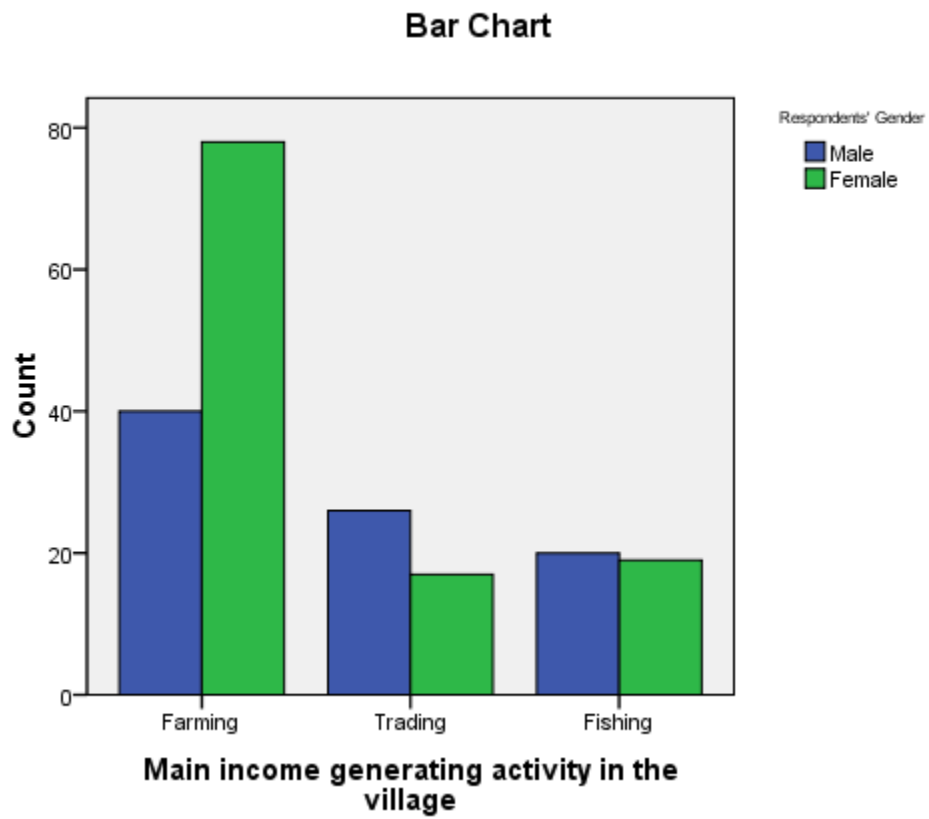


Figure 13: Housing: Wealth estimation level



Overall, in the 2 communities, 7.5% of the respondents live in their own house; 39% live in rented housing; 9% respondents share with others, and 44.5% respondents live in a family house. Houses themselves were constructed from a range of materials: 8.5% respondents lived in wattle and daub/ swish houses; 36.5% respondents lived in mud houses; 54% respondents lived in cement houses and 2% respondents lived in aluminium shacks.

7.1.1 Assessing the Knowledge of Respondents on Climate Change

A significant majority 75.5% of respondents had heard about climate change. Although this figure included more women than men, overall, a greater proportion of men than women in our samples had heard of climate change 83.7% men; 69.3% women. Most had heard about climate change from the radio 50.5% or television 32.1%. 12.8% participants said that they heard about it from a friend and 4.6% participants responded that they heard about it from family. Table 3 below indicates what respondents thought that climate change meant.

Table 3: Respondents' Knowledge on Climate Change

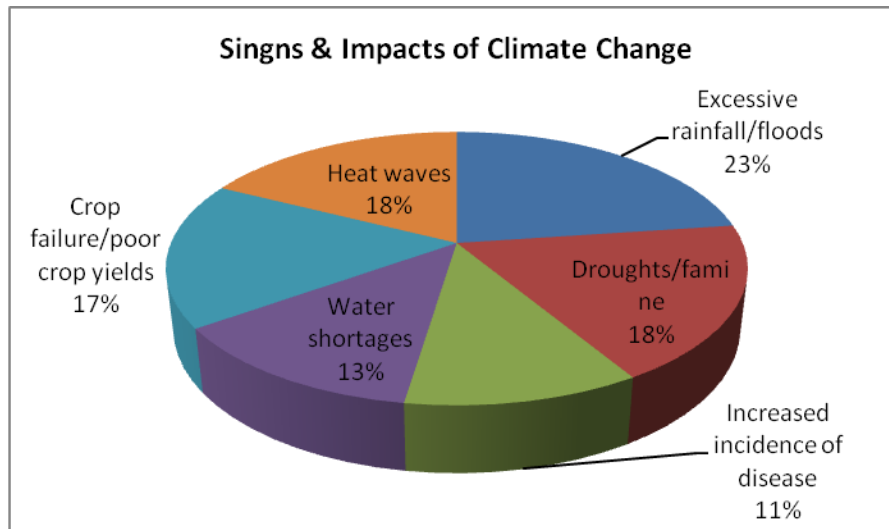
Knowledge	Frequency(Number of Respondents)	Percentage
Changes in weather over a long period(over 10years)	60	30.0%
Increases in temperature over long periods (over 10years	17	8.5%
All the above	35	17.5%
Don't know	75	37.5%
Change in Clouds	9	4.5%
Change of raining seasons	4	2.0%
Total	200	100.0%

Almost a third (30%) of respondents correctly stated that climate change included a range of weather parameters apart from temperature, 17 (8.5%) participants said climate change was only “increases in temperature over long periods (over 10years)” and thirty-five (17.5%) said both changes in weather including temperature over long periods was climate change. Other responses included 4.5% who said it was a changes in cloud cover and 2% said it was a change in rainy seasons. However, 75 (37.5%) participants did not know what climate change was. Overall, we classified the responses here into three: ‘no knowledge,’ ‘inadequate

knowledge,’ and ‘adequate knowledge’. 47.5% of respondents had adequate knowledge, 15% had inadequate knowledge and 37.5% had no knowledge.

Although most of our respondents knew something about climate change, with respect to the signs or impacts of climate change (see Figure 14 below), (22.8%) respondents knew about excessive rainfall; 18% increase in droughts; 18% increase in heatwaves, only 11.1% knew about the possible increases in disease incidence.

Figure 14: Signs and Impacts of Climate Change



We also questioned people about their knowledge of the causes of climate change. Table 4 indicates that most (66.7%) knew that indiscriminate tree felling was problematic and also (62.6%) cited bush burning as a cause of climate change. Most of the respondents (Eighty percent) of respondents stated that they had already seen some of the impacts in their communities.

Table 4: Knowledge on Causes of Climate Change

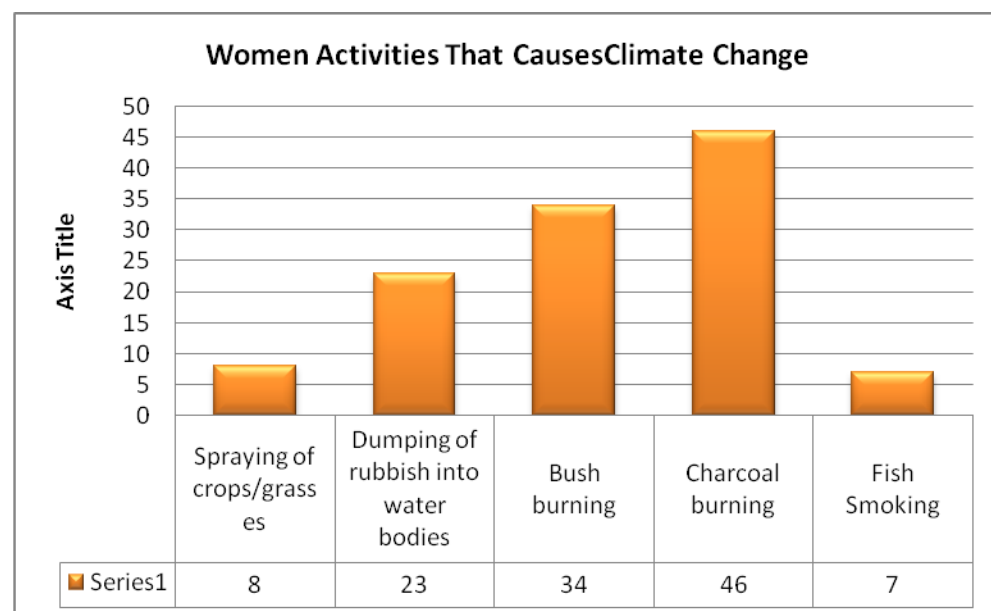
Options	Responses		Percent of Cases
	N	Percent	
Burning of fossil fuels (mostly for energy	68	18.1%	39.8%
Bush burning	107	28.5%	62.6%
Indiscriminate felling of trees	114	30.3%	66.7%
Industrialization	54	14.4%	31.6%
Farming(lives stock, manure and fertilizers	33	8.8%	19.3%
Total	376	100.0%	219.9%

7.1.2 Practices

A quarter of our respondents at the 2 sites, agreed that their daily activities can add to climate change, but the rest did not know or answered no. Activities correctly mentioned included bush/rubbish burning, sand winning, deforestation /indiscriminate felling of tree.

Only 128 people answered questions specifically on activities that women do that cause climate change. Activities mentioned are shown in Figure 15 below

Figure 15: Activities Perceived to Cause Climate Change



Activities mentioned for men were similar, but most respondents thought that men and women were affected differently. People agreed, in effect, that gender is a significant variable in examining and analysing the vulnerability to climate change impacts, for example, increasing women's workloads with respect to their reproductive work if there are disasters like floods or low crop yields; women's care responsibilities, especially with respect to children, are heavier with increase in disease incidence; women may have to travel for longer distances to get water, firewood and some supplementary food (for example rare leaves and other forest products for cooking in case of low crop yields); and the toll of higher average temperatures increases the stress and discomfort particularly of pregnant women. Issues identified by men included anxiety when crops fail as they were forced to look for alternate ways to provide for their households whether through farming or fishing. During disasters men tend to be at the forefront of immediate ameliorative action to counter the effects, and their work burden may be increased because of this.

Out of our total sample of 200, 167 (83.5%) knew that if they continued in engaging in activities that they knew led to climate change, they would increase the incidence of negative impacts. Only 6.5 % said there were no negative impacts, and 10% said they did not know if climate change had negative impacts. Negative impacts mentioned in this context included death, poverty, sickness/disease, loss of property, sadness/anxiety, hunger/famine, reduced family income, excessive heat and water shortage.

7.2 Traditional Coping and Adaptive Strategies

Various situations where respondents could adapt or cope with climate change were assessed.

7.2.1 Coping during Drought

During periods of excessive heat respondents swim in the river/stream, drank lots of water, took an additional bath at home, fanned themselves, slept outside/stayed in a cool place or did nothing. The most frequent response (42%) was drinking much water which helps to prevent dehydration. 11.9% of respondents do nothing to cope or adapt.

During droughts and or famines 72.6% of respondents said they had to buy food from big towns instead of getting it from their farms. In 8.5% of cases, people said they bartered personal property and household goods for food. Farmers felt the impact of drought most and switched to planting more drought resistant crops (4.5%) or alternative livelihoods (6%). These repeated droughts in recent years have forced them to change the planting dates.

7.2.2 Access to Water

Respondents in different parts of the communities had access to water from a range of sources. Most (51.3%) people had drinking water from pipes; 24.8% of participants got their water from a borehole; 8.1% from a hand dug well; and 15.8% participants from rivers and streams. In terms of a gender dimensions to water access women had more challenges. 53.5% male and 68.4% female participants responded, women walk long distances in search of water. In response to how they would cope or adapt 4.7% male participants answered they would relocate; 1.8% female participants responded that they would eat vegetation containing moisture; 3.5% male and 2.6% female participants responded that they would do nothing; 2.3% male and 9 % female

participants responded that they buy sachet water; and 1.2% male participants responded that they would dig shallow holes in the sand at the beach to access water.

7.2.3 Cultural Practices

Most respondents 83% had noticed changes in weather/climate and its consequences in recent times, but only 3.5% respondents thought the changes went back over more than 10 years: 61% of people had noticed the changes within 5 years; and 18% people had noticed the changes for between 5-10years. The youthful ages of respondents (most were below 40 years) probably explains the finding. Changes noticed included more irregular and heavy rains, changes in the timing of seasons and hotter temperatures over longer periods. These factors had resulted in low productivity and floods especially in the Keta area.

Seventy-four (37%) of respondents answered that there were cultural practices that contributed to help their ability to cope during problem periods. These included having specific days when they were forbidden to farm or fish, thus relieving pressure on resources and digging of wells in their home so they did not have to travel far for water. Women were expected to spend more time in their homes utilising resources to their utmost and also to plant new trees after cutting them for firewood or charcoal.

Respondents used firewood, charcoal and/ or gas for cooking. In both communities the use of charcoal was most common (53.5%). Respondents said it was mostly the responsibility of the women (47%) for selling charcoal, 38.5% said both men and women were responsible for charcoal production. Most (75%) respondents used the national grid for lighting and the others depended on kerosene, gas or generators.

7.2.4 Access to Credit

About 10% more men than women said that they had access to credit (37.2% men: 27.2% of women. Over the past 30 years there have been considerable efforts through a variety of schemes and programmes to improve women's access to credit.

7.3 QUALITATIVE ANALYSIS

KWANYAKU

Agriculture used to be the main activity in this community; however, due to the impacts of climate change and other socio-economic factors, trading has also become very important as an additional and/or alternate livelihood activity. According to the chief of Kwanyaku (Nana Ampim Darko), Kwanyaku is the first place in the Central Region where the late Reverend Peter Wulff Anaman brought cocoa seedlings from Akwapim Mampong for cultivation.

Rain-fed agriculture is undertaken in both the major (March-June) and minor (September-November) rainy seasons. Crops cultivated in the area include: cocoa, citrus, palm fruits, plantain, maize, cassava, tomatoes, okro and pepper. While most of the crops are cultivated in the major rainy season, vegetables (tomatoes, okro and pepper) are cultivated during the minor season when the rains are not that heavy.

Charcoal production is one of the alternative livelihood strategies in this community undertaken mainly by men. Selling of the charcoal may be carried out by both women and men. This activity has contributed to deforestation which the community is aware of and have been making efforts to develop plantations specifically for charcoal production. Collection of fuel-wood for cooking is done mainly by women and children.

Trading is an additional livelihood activity for most of the women in this community. This entails the selling of farms produce; cooked food or other household items depending on the financial ability of the individual.

Agriculture is carried out by men and women. Clearing of the land is mostly done by men whilst women are involved in planting; maintenance of the undergrowth and harvesting. Generally, most of the men would cultivate cocoa, citrus and palm fruits, whilst the women may prefer the vegetables, maize and cassava.



Figure 16: Maize and plantain farms

The youth in this community are not interested in farming activities, but rather engaged in trading of all kinds of items like footwear, clothing and other household items. Most of the youth have migrated to other urban areas to continue with their trading activities.

The river Ayensu passes through this community. The treatment plant for pipe-borne water from this river to the surrounding towns and villages is located in Kwanyaku. However, not all the people can afford to have pipe-borne water in their homes so women and children have the responsibility of fetching water from the public pipes. Some of the women and children would still fetch water from the river for washing or when potable water is not available.

7.3.1 Causes and Impacts of Climate Change in Kwanyaku

On the causes of climate change, both women and men pointed to deforestation, bushfires, emissions from vehicles and aircrafts and the use of agrochemicals as some of the determinants. A few of them said: *“God is punishing us for our sins.”* Most of the elderly women and men agreed that about thirty (30) years ago, there used to be thick forests between Kwanyaku and Agona Swedru (next big town), but now most of the trees have been removed. Erratic rainfall patterns and frequent extreme weather events such as floods and droughts have been experienced in Kwanyaku. Both women and men pointed out that the volume of water in the Ayensu River has been reducing over the last four decades and the sizes of fish have also reduced. They attributed these to the cutting of trees along the banks of the river. Additionally, the river is being polluted by domestic waste due to the closeness of a refuse dump. The reduced volume and pollution of the river within the community means that women and children travel longer distances to where they think the river is cleaner to fetch water.

7.3.2 Coping Strategies

In 2010, the community experienced very serious floods which destroyed almost all farms except those who had farms on higher grounds. Coping strategies in this community are mainly focused on planting of short-

term crops, cultivating more than one are and alternative livelihood activities. In the focus group discussions, some of the men indicated that to cope with that disaster, they had to switch to short term crops such as vegetables and sweet potatoes to enable them get some income. Most of the women had to borrow money to engage in full time trading to enable them get some income and also prepare for the next farming season. Those who had more than one farm at different elevations were able to harvest some crops.

7.3.3 Traditional Knowledge

Both men and women shared some traditional knowledge which have enabled them determine the onset of the rains for the planting season. They indicated that depending on the heat and cold weather from the month of December onwards, they can determine whether the rains will come early or late. When there are longer cold spell then the rains will delay, but when the cold spells are short then the rains will come early. Some also informed us that up until about 1990, they could determine when it would rain based on some stars around the moon, but now even when they see those stars the rains never come on time.

7.3.4 Cultural Practices

Tuesdays have been set aside by the traditional authority as a day of rest for farmers.

7.3.5 Access to Resources

Both women and men emphasized the need for micro finance services to enable them access loans without collateral for their various livelihood activities. Some of the men suggested the construction of small dams for irrigation as an adaptation measure in view of the erratic rainfall patterns.

7.3.6 Conservation of Natural Resources

The women outlined the following as means of conserving natural resources:

- Reforestation
- Enforcement of traditional rules of protection of forests and River Ayensu
- Tree planting

The men also outlined the following:

- Relocation of refuse dump
- Tree planting
- Cultivating plantations for charcoal production

KETA

As a low-lying coastal plain with the highest point of only 53 metres above sea level, the Keta Municipality has been affected by severe sea erosion in the past decades. The general elevation of the lagoon basin is also below sea level and the basin is generally marshy due to the underlying sandy-clay geological formation.

The presence of the sea and lagoon makes fishing one of the important livelihood activities in the Keta area. Extraction of the fish from both sea and lagoon are undertaken by men and boys, while the women market and process the fish. The men stressed that some fishermen use chemicals and unapproved nets for fishing resulting in the depletion of some fish stocks.



Figure 17: Canoes for fishing and fishing on the lagoon

Subsistence agriculture is another important activity within the community. The main crops cultivated include shallots (onions), okro, maize and cassava. In the dry season, farmers use water from boreholes within the farms for irrigation. Both women and men undertake farming at all the stages.



Figure 18: Shallot and maize farms in Keta

7.3.7 Causes and Impacts of Climate Change in Keta

Both men and women attributed the causes of climate change to burning of fossil fuels, exhaust from vehicles, deforestation, which has resulted in: frequent flooding from the sea and the lagoon, dwindling numbers and sizes of fish, sea level rise and changes in bumper fish harvest season. They referred to the impacts of sea level rise which has encroached on settlements leading to movements of families from their original homes to new settlements. Flooding destroys the fish processing units (Chorkor Smokers) of the women as well as the farms for both men and women. When the processing units are destroyed, the women are forced to sell their fish at very low rates or on hire purchase, but most of the time the women are not able to recover their monies and therefore reducing the household income. Routes to other communities are also cut off and movements of people are restricted.



Figure 19: Inundation of old settlements by the lagoon and new settlements provided by Government

Both the older women and men mentioned a couple of buildings like churches which have been inundated by the sea. To prevent further encroachment by the sea, the Government of Ghana has erected a sea defence wall in Keta. The men stressed that in the past, Keta had floods once in about seven years, but for the past 4 to 5 years they have been experiencing floods every year.

The farmers noted that due to the erratic rainfall patterns they do not have enough time to prepare their lands for planting. They thought that the major rainy season has shifted.

7.3.8 Coping Strategies

During floods when the lagoon inundates the farms, fish from the inundated farms are marketed by the women to supplement their income. Some of the women fishing net owners are compelled to go into vegetable farming in order to build up their capital and supplement their income. The men undertake animal rearing, basketry, kente weaving and production of batik as their coping strategy. Some men acquire both high

and low lands for farming so that in times of flooding they can rely on the proceeds from the farms at the higher elevation.

7.3.9 Traditional Knowledge

The women had identified that in the past, the arrival of the sea turtle to lay eggs on the beach signified bumper fish harvest.

7.3.10 Cultural Practices

The Keta lagoon is very big and surrounded by different villages and so depending on the traditional area; certain portions are closed for fishing. Fishing is prohibited on Sundays, Tuesdays and Wednesdays depending on the various traditional area rules. Within the lagoon, certain portions are also cordoned off to prevent fishing for certain periods. These serve as conservation methods for the resources in the lagoon. When the community notices that there is dwindling of fish stocks in the lagoon they perform rites which involve the throwing of carcasses into the lagoon as a form of pacification to the gods. Though they believe that this will pacify the gods, in actual fact the carcasses attract and serve as food for the fish.

Table 5: Activity Profile for Kwanyaku Communities

COMMUNITY	ACTIVITY	MEN'S ROLE	WOMEN'S ROLE	ACCESS AND CONTROL
	<p>Agriculture</p> <p>The most important activity in the community. Uses rudimentary techniques such as weeding and burning. Tools used include hoes and cutlasses.</p>	<p>The men are mainly responsible for initial ploughing and clearing of the land. They participate in most activities for the major crops like maize, cassava and palm fruits.</p>	<p>They help in planting and maintaining the farms for all major crops. In addition they are solely responsible for the vegetable farms such as pepper, tomatoes and okro.</p>	<p>Most men and women do not have access and control over land. Farmlands are rented out to them by the rich few and the proceeds are shared between owners and farmers which and be 50:50 or 40:60 depending on the terms of the land owner. In addition socioeconomic status further widens the gap. Few women may however, have access and control to land by inheritance.</p>
	<p>Charcoal production</p>	<p>Men play a major role; they are</p>	<p>Women are mainly responsible for</p>	<p>Men have more access and control</p>

	One of the activities in the area	responsible for both production and selling of charcoal.	selling the charcoal	over this activity
	Trading Has gained importance recently for the youth since they have little interest in farming as yields have become unpredictable with increasing disasters like the floods of 2010 which destroyed a lot of farms. For the older generation this is an additional income generating activity, becoming even more important after the floods in 2010 as an alternative source of income.	Men bring in clothing and footwear from the bigger cities to sell to supplement the family income	Women add to the income of the family by buying foodstuff and other food items like rice from outside the community to sell from their homes.	Both men and women have access to the activities based on their ability to purchase. Both men and women have control over their profit. In some cases the men may take control of the profits from the women.

	<p>Firewood and water collection</p> <p>Firewood is one of the sources of energy for cooking in the community. Water from the river is used to wash clothes and families fetch water from public taps for other household activities.</p>	No significant role	<p>Women and children are responsible for collecting the firewood and fetching water for the household. They also wash clothes at the riverside.</p>	<p>Women have access and control over these activities. Recently they have had to travel further to get firewood for the household due to deforestation.</p>
	<p>Fishing</p> <p>Minor activity within the community, mostly for domestic use. Recently, the volume of the river has been decreasing and fish sizes have become smaller.</p>	<p>Men are mainly in charge of fishing. This is done by cutting trees along the river and using them to trap the fish.</p>	<p>They do not play any significant role</p>	<p>Men bring fish home for domestic use.</p>

Table 6: Activity Profile for Keta Communities

COMMUNITY	ACTIVITY	MEN'S ROLE	WOMEN'S ROLE	ACCESS AND CONTROL
	<p>Fishing</p> <p>One of the main economic activities in the community.</p>	Men are in charge of both marine and lagoon fishing.	Women process and sell the fish.	Men have most access and control but few women also own fishing canoes and nets.
	<p>Agriculture</p> <p>The second major economic activity. Farms are mainly irrigated with shallow wells. This requires an initial capital for digging the wells, buying irrigation pumps, fertilizers and pesticides.</p> <p>Farmers still use rudimentary techniques such as hoes and cutlasses to clear and maintain the land.</p>	Mainly involved in cassava and maize farming. There are also a few men who are involved in shallot and vegetable farming.	Mainly in shallots (onion), pepper and okro farming.	Both men and women have access to farm lands because lands are family property. However, the men have more control because they are heads of the households and have more finances for the wells needed for irrigation. Men can clear larger portions of farmland because they are stronger and insist on taking all the children of

				the family to weed on their land. Men can also use some forest lands for farms but these may be far from the household which deters women from accessing those lands.
	Sand Winning	This activity has become important since Keta was upgraded from a district to a municipality. There has been an increase in infrastructure development and the use of sand.	Men are in charge of this activity	Women have no significant role in this activity.
	Trading Mainly of farm produce and fish.	Men do not play a major role in this activity. They mainly cut mangroves to sell as fuel wood.	Women are the primary agents for trading. They are involved in selling vegetables and fish. They process the fish (smoking,	Both men and women have access to this activity. Female headed households control their profits whilst women from male

			drying and salting).	headed households use part of their profits to subsidize the family expenditure.
	<p>Firewood and water collection</p> <p>Firewood is one of the sources of energy for cooking in the community. Families fetch water from public taps for household activities.</p>	Men's role is to cut the mangroves and sell.	<p>Women and children who pick the smaller wood and twigs for daily household use.</p> <p>Women and children fetch water from taps for household use.</p>	<p>Women have access and control over these activities. Recently they have had to travel further to get firewood for the household due to deforestation from cutting of mangroves.</p>

8.0 CONCLUSIONS AND RECOMMENDATIONS

The key determinants of adaptive capacity include:

- Equitable access to and distribution of resources;
- Equitable access to and control over assets;
- Equitable access to appropriate information, technology, skills and infrastructure;
- Empowerment and social inclusion.

A mix of appropriate coping and adaptative strategies is necessary for the survival of the poor. Past climate hazards and trends, or perceptions of these hazards, influence adaptative strategies selected in terms of crops planted, diversification, and household labour distribution. Climate-induced catastrophes like crop failure for whatever reason have to be dealt with using a range of coping strategies appropriate for the local ecological zone. Although some research (Davies, 1996) seems to suggest that coping strategies tend to be simply reactive and associated with negative outcomes, we see them as an important temporary measure to allow people to reorganise and put in place longer-lasting adaptative strategies such as wells for irrigation, diversification of livelihood activities and, perhaps, a changed division of labour among household members.

8.1 CONCLUSIONS

Our study indicated the following:

8.1.1 Gaps in Knowledge and Practices

Knowledge held is an indicator of available information, and most respondents 166 (83%) had noticed changes in weather/climate and impacts in recent times indicating their knowledge/ perception of climate change. We noticed that there were some practices, already in existence, that could be reinforced and reproduced to serve as adaptative strategies, for example, planting trees after felling for firewood or charcoal making; well-digging in homes (so people do not have to travel so far for water), or asking women to spend longer on reproductive activities so that existing resources could be used more sustainably.

Only a third of the people interviewed in our surveys comprehensively defined climate change and still fewer knew about the signs and impacts of climate change. Though about 60% of respondents knew some of the better known causes of climate change, 40% could not correctly identify a broader range of those causes. In addition to focussing on knowledge dissemination to all parts of the communities, we identified some existing

adaptive practices that could perhaps be developed further. Both knowledge dissemination and enhancing existing (and developing new) adaptive strategies require serious and targeted inputs in terms of policy and practice so that climate resilience can be improved in the sample communities and beyond. Our sample communities have given us examples of specific adaptive practices. Broader policy and practical inputs need to be worked on in a wider range of communities. A 'one size fits all' intervention can not be appropriate here.

8.1.2 Gender Linkages

Proportionately more men had heard about climate change than women and most people said men and women are affected differently by climate change and highlighted how vulnerability can vary with gender role as we have outlined in the body of the report. There are pronounced gender divisions of labour and responsibility in the two communities, for example, access to and control of natural resources differed in the communities and for different activities. In Kwanyako the majority of both men and women farmers had limited control over lands for farming since land tends to be which puts restriction on crop diversity and investment in infrastructure like irrigation. Even where women were relatively successful, however, and made profits from their enterprises, whether farming or trading, they might be restricted in the use of their money because local norms tend to support male control over money. In general men had more access and control over money and other resources. This differential access to control over money was identified as important, and both men and women expressed the need for access to microfinance/loans for further investment. In Keta, although the gender division of labour was different, local patriarchal norms also tend to restrict the potential for women's investments.

8.1.3 Coping Strategies

In times of adversity most communities have some strategies for reacting and coping. Traditional strategies for coping during flooding, water scarcity and droughts are reactive and *ad hoc*: there were no disaster plans in place. But our survey respondents had already put some measures in place: they had identified the changes in seasons and had started altering planting dates to coincide with new seasonal patterns, planting short-term crops, and diversifying livelihoods. For example in Keta, women fishing net owners have moved into vegetable farming in order to build up their capital and supplement their income. The men undertake animal rearing, basketry, kente weaving and production of batik as diversification. In addition, some men have

acquired farms on higher land, in addition to their traditional lower lying farms so that when there are floods (most years now) they can fall back on harvests from the higher lying farms. These strategies need to be consolidated and further developed to help improve climate resilience. As stated at the end of paragraph 8.1.1, this will require capacity building, policy development and implementation as well as inputs, in both material, technological terms, to help create/ reinforce local ideas, beliefs and practices on environmental and gender related issues.

We found no existing plans or policies in the communities that aimed to support the development of coping and adaptative strategies. There were no platforms where people's traditional knowledge and coping strategies could be developed further and used as community owned strategies. Since patriarchal norms were in evidence in both communities, addressing these issues will require gender sensitive approaches to enable us to identify and enhance women's potential in the communities.

8.2 RECOMMENDATIONS

1. Development of gender sensitive policies and, perhaps, legislation to improve women's access and control over assets and finances as well as ensuring equitable distribution and availability of resources. There is the need to work with opinion leaders including chiefs to develop specific and relevant policies to enhance access and control and prevent gender biases. These policies should include the development of sound adaptative/ coping plans and strategies for the areas.
2. Improvement of equitable access to appropriate information, technology, skills and infrastructure in adaptative strategies like irrigation. Training and sensitisation programmes are needed in the areas to create more awareness and improve knowledge in the causes, impacts and prevention of climate change and its effects.
3. Empowerment of women and men by providing access to microfinance. Micro-finance and other loan facilities need to be made available to the people in the communities to improve their ability to expand their farms and diversify their crops as well as to go into alternate livelihoods during disaster situations, and as traditional sources of income dwindle through long term changes.
4. A programme of education/ improvement in knowledge about climate change, gender and environmental sustainability more generally in the communities.

9.0 REFERENCES

- Adger, W.N. 2006. 'Vulnerability'. *Global Environmental Change*, 16, 268-281.
- Adger, W. N., et al. (2007). Assessment of adaptation practices, options, constraints and capacity. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. v. d. Linden and C. E. Hanson. Cambridge, UK, Cambridge University Press: 717-743.
- Agyemang-Bonsu et al, 2008. *Ghana Climate Change Impacts, Vulnerability and Adaptation Assessments* (The Netherlands Climate assistance Programme)
- Ardayfio-Schandorf, E. and Kwafo-Akoto, K. 1990. *Women in Ghana: an annotated bibliography*. UNFPA: Woeli Publishing Services, Accra
- Babugura A. 2009. *Gender and Climate change: South Africa case study*.
- Barrett, Hazel R. and Angela W. Brown, 1988. Women's horticulture in the periurban zone, the Gambia. *Geography*, 73(319):158-160.
- Bour, D. 2004. Water Needs and Women's Health in the Kumasi Metropolitan area, Ghana." *Health & Place*, 10:85-103.
- Bradshaw, S. 2004. *Socio-economic impacts of natural disasters: a gender analysis*. Santiago: Sustainable Development Human Settlements Division, Women and Development Unit. Series, 32.
- Cleaver, F. 1997. Gendered Incentives and Informal Institutions: Women, Men and the Management of Water. In D. Merrey and S. Baviskar (Eds.), *Gender Analysis and Reform of Irrigation Management: Concepts, Cases and Gaps in Knowledge*. Proceedings of Workshop on Gender and Water, September 15-19, Sri Lanka. Pps. 43-62. Ed. D. Merrey and S. Baviskar.
- Crow, B. and F. Sultana. 2002. Gender, Class, and Access to Water: Three Cases in a Poor and Crowded Delta. *Society and Natural Resources*, 15(8): 693-724.
- Dampney, P. T. M. 2008. *Gender and Community Water Resources Management in the Lower Kakum Basin*.
- Dankelman, I. and Davidson, J. 1988. *Women and environment in the Third World: alliance for the future*. Earthscan Publications, London, UK.
- Davies, S. 1993. *Are Coping Strategies a Cop Out?* *IDS Bulletin*, 24(4): 60-72.
- Davies, S. 1996. *Adaptable livelihoods: Coping with food insecurity in the Malian Sahel*. Houndmills: Macmillan Press.

EPA, Ghana 2002. *Water Quality Standards. National Workshop on water Quality Standards*. Accra, September, 2002.

Ghana Government Reports:

EPA Report (2000).

Ghana Shared Growth and Development Agenda 2010-2013

Ghana Vision 2020: The First Step (1996-2000); the First Medium-Term Plan (1997-2000);

Ghana Poverty Reduction Strategy (2003-2005);

Growth and Poverty Reduction Strategy (2006-2009)

National Development Planning Commission Act, 1994, (Act 479)

National Environmental Policy, Ghana

National Environmental Action Plan, Ghana

National Land Policy, Ghana, 1999

National Climate Change Adaptation Strategy, Ghana 2010

National Climate Change Policy Framework Ghana, 2011

Second National Communications, 2011

Higgins, P.A. and H. Alderman. 1997. "Labor and Women's Nutrition: The Impact of Work Effort and Fertility on Nutritional Status in Ghana." *The Journal of Human Resources*, XXXII(3):577-594.

lipinge, E.M., & Williams, M. 2000. *Gender and Development*. Windhoek: John Meinert Printing.

IPCC. 2001. Summary for Policy Makers. In *Climate Change 2001: Impacts, Adaptation and vulnerability*. Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.

Kabonesa, C. and Happy, M., 2003. The Gender Gap in Water Resource Management in the Nile Basin Countries: The Case for Rural Women in Uganda. Presented at a conference on Role of NGOs and Media in the Nile Basin Initiative, March, Kyoto.

Meena, R. 1992. *Gender in Southern Africa: Conceptual and Theoretical Issues*.

Meinzen-Dick, R. and Zwarteveen, M., 1997. Gendered Participation in Water Management: Issues and Illustrations from Water User Associations in South Asia. In D. Merrey and S. Baviskar (Eds.), *Gender Analysis and Reform of Irrigation Management: Concepts, Cases and Gaps in Knowledge. Proceedings of Workshop on Gender and Water*, September 15-19, Sri Lanka. Pps 173-189.

Minia, Z. 2008. *Climate Change Scenarios Development*.

Nelson, W. and Agbey, S. 2008. *Climate Change and Poverty Linkages*.

Norgaard, R. and Howarth, R. 1991. Sustainability and discounting the future. In *Ecological Economics: the Science and Management of Sustainability*, Edited by R. Costanza, 88-101. New York: Columbia University.

Okorley et al, *Women in Agro-Processing in Ghana: A Case Study of the State of Women in Small-Scale Fish Smoking in the Central Region of Ghana*.

United Nations, *The Human Development Index* (2001 and 2007/2008)

United Nations Development Programme (UNDP) 2003. *Mainstreaming Gender in Water Management, A Practical Journey to Sustainability: A Resource Guide*. New York.

Venkateswaran, S., 1995. *Environment, Development and the Gender Gap*, New Delhi: Sage Publishers.

Whitehead, Anne, 1979. Some Preliminary Notes on the Subordination of Women, *IDS Bulletin*, Vol.10, No.3.

10.0 APPENDICES

INTERVIEW GUIDE

Focus group discussions and key informants

Do you know about climate change? If yes, what do you know about climate change?
Where did you get your knowledge on climate change?
What is your understanding about climate variability?
Would you say there is a difference between climate change and climate variability? If yes,
What would you say the difference is?
If no, why do you think there is no difference?
What kind of activities are women and men involved in?
What is the status attached to each activity? • How much time is used in each activity?
What are the main livelihood strategies?
What other livelihood strategies are used and what is their contribution?
What kind of formal and informal employment is available in the community?
What criteria are used in recruitment?
What natural resources are available in the area?
What are the uses of these resources?
Rank the natural resources in terms of value and importance
What are the local rules with regard to the use of these resources?
Who has access to the resources identified?
Who has the right to use the resources identified?
Who owns the resources identified?
Who makes decisions about natural resource ownership, use, access and benefit sharing?
What are the gender differences in access to resources and what is the reason for these differences?
What are the current land tenure rights in the community?
Who has land rights in the community?
What are the major land uses within the community?
How (and who) is land allocated in the community
Do men and women have equal opportunity to own or inherit land? How?
What climatic events/ natural disasters have been experienced in the community?
Which of the events are the most frequent?
How do these climatic events/ natural disasters impact on the community and individuals within the community?
What activities is the community/ individuals involved in that are affected by these climatic events/ natural disasters?
How far does the impact of the climatic events stretch?
Has there been an increase in the number of these extreme climatic events/ natural disasters?
Is there a group of people that is better prepared for these climatic events/ natural disasters? Why is this so?
Is there a platform where environmental problems are discussed and/ or information is shared?

Who discusses these problems?

How did each household and the community deal or cope with the climatic events/ natural disasters mentioned above?

What social structures (e.g. social networks) help the community to cope and deal with climatic events/ natural disasters?

Who makes use of these social structures?

Who benefits from these social structures?

What norms, beliefs, laws and programmes (local and national) make dealing with climatic events/ natural disasters more difficult and reduce ability to cope?

What norms, beliefs, laws and programmes (local and national) make dealing with climatic events/ natural disasters easier and increase ability to cope?

Which weather or climate related problems make agricultural production difficult and also affect household livelihoods (access to natural resources)?

What is done to prepare for and deal with such problems?

What will individuals; households and the community do if:

- Flooding becomes more frequent
- Drought becomes more frequent
- Pests and insect outbreak becomes more frequent
- Changes in growing seasons (shorter growing season)
- Shortage of water
- Areas suitable for crop production becomes less
- Areas suitable for grazing becomes less
- Conditions becomes more drier
- More disease outbreaks
- Increased good rainfall years

What natural resources and services help individuals, households and the community cope better with climatic events/ natural disasters?

During natural disasters are there some natural resources (fruits, etc) that become more abundant and contribute towards household livelihoods?

What are the aspirations of women and men in the community?

What would you like to see happen that will help women and men cope better and adapt to climate variability and climate change?

What adaptation options can be developed and implemented to lower risk and vulnerability to climate change?

What kind of policies or programmes do you think would be effective in reducing vulnerability of women and men to climate variability and future climate change?

Are there any specific needs you feel should be addressed urgently in order to build the coping and adaptive capacity of women and men?

QUESTIONNAIRE FOR FIELD WORK

DEMOGRAPHY

- 1) Name _____
- 2) Sex Male Female
- 3) Age <20 years 20-29 30-39 40-49 50-59 > 60 Don't know
- 4) (a) Marital Status Single Married Divorced Widowed
- 5) Level of Education None Primary Secondary Tertiary
Other _____
- 6) Religion None Christian Muslim Traditional Other
- 7) Ethnic group Akan Ga/Adangbe Ewe Others specify
- 8) Occupation
Skilled _____
Unskilled _____
- 9) *Estimated* total monthly income (GH Cedis) for the household (from all occupations)
< 40 <60 <80 <100 >100 > 150 Other.....
- 10) Wealth level
- a) Housing Own Rent Shared Family Other
- b) Housing material Mud Brick Cement Aluminum Other
- c) Personal property (*tick as applicable*) Bicycle Car Tractor Television
Radio Agricultural equipment Pump Other

KNOWLEDGE ABOUT CLIMATE CHANGE

11) Have you heard about climate Change? Yes No

If yes, where did you hear it from?

(1)Radio (2) Television (3) Friends (4) Family

What is climate change?

(a)Changes in weather over a long period (over 10years)

(b)Increases in temperature over long periods (over 10 years)

(c)All the above

(d) Don't know

(e) Other specify.....

12) What are some of the signs/impacts of climate change?

(a) Excessive rainfall/floods

(b) Droughts/famine

(c) Increased incidence of diseases

(d) Water Shortages

(e) Crop failure/poor crop yields

(f) Heat waves

(g) Other specify.....

13) What are some of the causes of climate change?

(a) Burning of fossil fuels (mostly for energy)

(b) Bush burning

(c) Indiscriminate felling of trees

(d) Industrialization

(e) Farming (livestock, manure and fertilizers)

(f) Other specify.....

14) Have you observed any of the impacts of climate change in your community?

(a) Yes (b) No (c) Don't know

PRACTICES

15) In your daily lives do you do anything that can cause climate change? (a) Yes (b) No (c) Don't know

16) If yes, what do you do that can cause climate change?

.....
.....

17) What are the activities that women do that cause climate change?

What are the activities that men do that cause climate change?

18) In your opinion do you think men and women are affected differently by the impacts of climate change?

(a) Yes (b) No (c) Don't know

19) If yes, in what ways do the impacts affect men and women differently?

.....
.....
.....

20) Does climate change have any negative impacts? (a) Yes (b) No (c) Don't know

If yes, what are they?

.....
.....

Traditional Coping and Adaptive Strategies

21) In your community how do you cope when there is flooding?

(a) Relocate

(b) Go into shelters

(c) Share homes which are not flooded

(d) Do nothing

(e) Other specify.....

22) In your community how do you cope when there are heat waves/excessive heat?

(a) Swim often in the river/stream

(b) Drink lots of water

(c) Do nothing

(d) Other specify.....

.....

23) In your community how do you cope when there is famine/drought (food, purchases, change of seasons, irrigation, changing planting dates, drought resistant crops, change of livelihood?)

(a) Buy food from the market in the big towns instead of getting it from our farms

- (b) Batter out property for food
- (c) Exchange members of our family for food
- (d) Change planting dates
- (e) Change livelihood/occupation
- (f) Plant different more resistant crops , name them

.....

.....

.....

(g) Do nothing

(h) Other Specify

24) In your community how do you cope when there is water stress or scarcity (inadequate, what do you do?)

- (a) Men walk long distances in search of water
- (b) Women walk long distances in search of water
- (c) Relocate
- (d) Eat vegetation with moisture
- (e) Do nothing
- (f) Other specify.....

Cultural Practices (hinder coping and adaptation)

26) Are there any cultural practices that enhance your ability to cope during the above situations?

Yes No

If yes please specify

.....

.....

.....

27) Are there any cultural practices that prevent you from coping during the above situations?

Yes No

If yes please specify.....
.....

28) Have you noticed any significant changes in the weather in the past? (1)Yes (2)No

29 If yes what exactly have you noticed?

.....

30) For how long? (a)5years (b)10years (c)>10years

ENERGY

31) What energy sources are used in the preparation of food?

(a)Firewood (b) Coal (c) Other.....

32) Who collects them? [a] men [b] women [c] children [d] all

33) What is your source of power? (a) National grid (b) Kerosene (c) Generator

(d) Other specify.....

34. What is power mainly used for? (a) Lighting (b) Cooking (c) Other (specify).....

35. What do you use in cooking? (a)Charcoal (b) Firewood (c) Gas (d) Other (specify)

36) Is there any charcoal production in this community? (a)Yes (b) No (c) Don't know

37) Do you think there are any effects of charcoal production on the community or in the forest?

(a) Yes (b) No (c) Don't know

38) If yes, please explain.

.....

AGRICULTURE AND WATER RESOURCES

39) Is there any fishing in surrounding streams/river? Yes No

40) Are there any regulations to protect fish and other aquatic fauna? Yes No

41) If yes, what kind is it?

Official

Local

Self imposed

(d)Other Specify.....

53) Do you get water throughout the year? (1)Yes (2) No

54) If no, for how long do you get water in a year (in months): (a) 1 – 3 (b) 3-6 (c) 6-9 (d) 9-12

ACCESS TO FINANCE AND CREDITS

55) Do you have capital for your economic activity? (1) Yes (2) No

56) If yes how much capital: ₦10- 50; 50- 100; over 100

57) How much profit do you make per month:.....

58) How often do you save? (1) daily (2) weekly (3) monthly

Other (specify).....

59) Are you able to access credit: (1) Yes (2)No

60) If yes, where: (1)bank (2)moneylender (3) other (specify).....

61) If no, why:.....

62) What is the main income generating activity of women in the village? (1)Farming (2) Trading (3)

(4) Other, specify.....