CLIMATE CHANGE AND HUMAN HEALTH IN ACCRA, GHANA

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LIST OF ACRONYMS

AMA	:	Accra Metropolitan Assembly
CHF	:	Corporate Housing Foundation
COP	:	Conference of Parties
EPA	:	Environmental Protection Agency
GAMADA	:	Ga-Mashie Development Authority
GHS	:	Ghana Health Service
GMS	:	Ghana Meteorological Service
IDRC	:	International Development Research Centre
ITNS	:	Insecticide Treated Nets
MPHIL	:	Master of Philosophy
NADMO	:	National Disaster Management Organisation
NDPC	:	National Development Planning Commission
NHIS	:	National Health Insurance Scheme
PHD	:	Doctor of Philosophy
RIPS	:	Regional Institute for Population Studies
UGMS	:	University of Ghana, Medical School

1.0 EXECUTIVE SUMMARY

Climate change poses an increasingly recognizable threat to the livelihoods and well being of Ghanaians. In agricultural areas, the degradation of soils and water resources, and the escalation of droughts have contributed to the deterioration of livelihoods. This has resulted in farming families sending one or more of their barely-adult offspring to urban areas. These migrations contribute to fuelling the urban proliferation in sub-Saharan Africa, currently the fastest urbanizing continent in the world. Urbanization is therefore creating slums encumbered by poor sanitation, rampant malaria, HIV/AIDS and other infectious diseases, unemployment, and crime. At the same time urban dwellers are more likely to be exposed to the risks of floods, and other climatic conditions.

Human adaptive strategies to respond to climate-related events such as, floods, high temperatures and sea level rise are intrinsically tied to people's ability to reduce their vulnerability to daily shocks and stresses, including from disease. Climate change is likely to exacerbate these shocks and stresses, particularly among the poorest and most vulnerable populations (i.e. fishers, slum dwellers, etc) and, therefore, inhibit the attainment of the Millennium Development Goal of combating HIV/AIDS, malaria and other diseases. In Ghana, there is weak scientific and policy planning capacity to integrate climate compatible strategies into climate sensitive sectors, such as in the health sector. More so a multi-sectoral approach is demanded if the country must build resilience of both urban and rural settlements exposed to climatic events and extremes. In view of this and to ensure project findings are incorporated into national policy and planning, the project team through a participatory research approach, involved representatives from the Ministry of Health Ghana, Ghana Environmental Protection Agency, Ghana Meteorological Services, The National Disaster Management Organisation and the city engineer unit of the Accra Metropolitan Assembly.

Overall, the project sought answers to the following questions posed; (i) How do urban dwellers think about climate change? (ii) What are the general stressors (including climate change) that impact their livelihoods? (iii) To what extent does health feature in their livelihood stressors (iv) How do communities establish the link between climate change and health (v) How has their

health been affected (past and present) by climate variability and change? (vi) Are there some lessons about these health effects that could inform health care planners and policymakers to be better prepared for future climate change impacts? (vii) Do existing water and sanitation systems cope with climate variability and extremes (flooding, torrential rains)? (viii) How can these systems be strengthened to protect the health of urban communities in the face of climate change (ix) Are urban populations experiencing health changes that could be linked to climate change?

The three originally study communities proposed were; Ussher Town, James Town (Ga Mashie) and a heterogeneous migrant community off the Odaw River, Old Fadama in Accra. These communities are typical examples of the scenario depicted above in the previous paragraph. However, immediately after the signing of the project contract, the Government of Ghana served strong notice regarding the evacuation of the people of Old Fadama. This was communicated to the International Development Research Centre (IDRC) Programme Officer in Dakar. After some discussions on the issue by the team, it was agreed that a substitute study community should be considered. Three communities (Agbogbloshie, Sukura and Glefe) in Accra were proposed, and the team made reconnaissance visits to the proposed communities on 25th September 2009. The general consensus of the team was that Agbogbloshie would be a suitable replacement for Old Fadama, since they have similar environmental conditions. More so, Agbogboloshie like the Old Fadama community is a highly heterogeneous community made up of the Ga people and migrants.

Over the past three years, the project team responded to all the research questions through the use of both qualitative and quantitative methodologies. Summary of key findings based on the research questions are as follows:

Generally, urban dwellers perceive climate change as something real but they assign different reasons for it. They believe that the climatic condition in the area today is not as it used to be some three decades ago. They mentioned decline in fish catch and also increase in diseases in the area. Even though, they could not tell empirically how the climate has changed in the area, their explanations indicated an awareness of unusual ‘occurrence’ within their immediate environment

that demanded attention. They explained climate change to mean changes in weather patterns. They mentioned the increasing trend of certain diseases such as malaria, cholera and other diarrhoea ailments as being the consequences of climate change. While some uphold that changes in climatic conditions in the area is a punishment from God premised on their disobedience; others uphold that it is as a result of industrial development that has led to the accumulation of carbon dioxide in the atmosphere. Thus, people in the study communities have diverse knowledge on climate change.

Climate related stressors mentioned by study communities include, flooding, high temperature (heat), and coastal erosion. However, some non-climate related stressors were mentioned and they include: poverty, poor health services, air pollution, sanitation challenges, teenage pregnancy, prostitution, lack of education, and challenges with industrial waste disposal. The project also identified the following health issues that came up as major stressors in the communities. They are malaria, skin rashes, cholera and other diarrhoea, and respiratory-related ailments. The health challenges were linked to the poor environmental conditions in the communities. Although, the communities agreed that these diseases have a long history in the communities, they also opined that recent increase in rainfall and temperature witnessed in the communities has led to an increase of these diseases. In addition, the project team also noted the increase in human population within the study communities. However, despite this increase water and sanitation infrastructures have not improved thus are in very poor states. Hence, the use of public toilets is commonplace in all the communities and this could be a source of disease transmission in the communities.

In establishing the link between climate change and health in the communities, a research by a MPhil student on the project revealed that there is a relationship between incidence of malaria and rainfall variability in the study communities. Analysis of linkages between climate change and health were done on two levels; macro and micro level. The macro level analysis was done using reported cases of malaria and rainfall data from the Centre for Health Information Management and Meteorological Agency, respectively, covering the entire capital, Accra. While the micro-level analysis was based on 497 household data collected from the Ga Mashie area. Salient findings on the macro level show a positive correlation between incidence of malaria and

volume of rainfall, including the number of rain days. However, there is a more significant relationship between increased incidence of malaria and number of rain days. Empirical evidence from the Ga Mashie community indicated a significant level of relationship between Community of residence, Level of education and the Incidence of malaria. Coping strategies adopted within sampled households include, the ownership and use of insecticide treated nets (ITNs) and inclusion of household members on the National Health Insurance Scheme (NHIS). Also, a study by the PhD student in the area indicates several causes of diarrhoeal disease. For instance, exposure to flooding in a poor environmental setting like Agbogbloshie exacerbates the incidence of diarrhoeal disease. The study communities are aware that stagnant water resulting from excessive rainfall breeds mosquitoes responsible for malaria transmission among the people. Also, is the acute awareness of the poor sanitary environment within these communities which was labelled as a source of pollution. Additionally, is the perception that flood waters could contaminate fresh water supplies which in turn could lead to diarrhoea incidences in the communities.

The majority of the households in the study communities either drink sachet or pipe borne water; with some households adding purifying chemicals to the pipe borne water to make it safer for drinking. Sanitary facilities within these communities include public toilet facilities, patronized by majority of the populace. These public toilets are shared by several people at any given time and with the unhygienic conditions in the use of these facilities disease transmission is guaranteed. This perhaps explains the high records of reported cases of cholera from the area in comparison to other districts in Accra. Also there are a number of refuse containers in the communities which are grossly inadequate for the number of households in these areas. More so, these refuse containers fill up rapidly and are left uncollected by refuse contractors for weeks. Climate change could be linked to some of the disease conditions in poor urban places. For instance, as a result of the variability of rainfall in the study area, the incidence of diseases such as malaria and cholera has in turn also changed from the months they occur. The details of these relationships are explained in subsequent sections in the report and also in other attached documents.

Finally, the link between climate-related events like rainfall and temperature and diseases such as malaria, cholera and non-cholera diarrhoeal disease, measles and cerebrospinal meningitis created a platform for the research team to make some proposals to policy makers on how these issues should be addressed. The project found that there is a lot of pressure on the sanitation facilities in the communities especially toilet facilities and refuse containers; as, some households that had rooms with toilet facilities three decades ago had converted them into living rooms to meet the increasing demand for accommodation in the area. Although, most of the public toilets in the area are water closet type, the poor hygiene practices being exhibited by caretakers, facilitate disease transmission in the communities.

2.0 OBJECTIVES

The general objective of the project was to bring about changes in knowledge, attitudes, and behaviour for enhanced resilience and adaptation to climate change, which will eventually lead to combating malaria and other diseases. This objective has been achieved to a large extent. In terms of knowledge, people in the study communities have been educated on climate change and possible health consequences through series of feedbacks and community report back meetings. Prior to the project there were a good number of social groups in the communities with none of them focusing on environmental issues. However, through the environmental education activities of the project, there is currently once in a month community- led sanitation exercise. This clean-up activity is solely organised through the concerted efforts of the different social groups within the community. Also, through the facilitation and mediation of the project team, a lingering conflict between Accra Brewery Limited and the Agbogbloshie community concerning effluent water discharged into the community was resolved.

Also, some of the project community facilitators in the James Town and Ussher Town communities established a community based agency and sourced funding from Corporate Housing Foundation (CHF), a non-governmental organisation to build a compost plant for the community. In addition, people who hitherto lived in flood prone areas in Agbogbloshie have constructed drains to facilitate easy flow of rain water to the sea during the rainy seasons. Furthermore, community members have also been sensitized on the consequences of disposing solid waste into available drains. Finally, most of the communities through their Assembly Members at the Accra Metropolitan Assembly are clamouring for city authorities to construct storm drains in their communities to safeguard lives from the impact of the annual floods within the area.

Specific objectives of the project were:

1) To understand how urban dwellers perceive climate change in comparison to other stressors, their adaptive capacity and to establish empirical linkages between changing climatic patterns and prevalence of diseases, water availability and sanitation provision.

This objective has also been addressed in the project. The general perception of the study communities on climate change was examined as well as the ways they were addressing the situation. The study found that the challenges in the study communities were linked to climate change which the people believe had affected their source of livelihood. They mentioned that the high levels of poverty and unemployment in the communities was as a result of the impact of climate change on their source of livelihood. They equally indicated that some fishermen have stopped fishing and rather have resorted to other businesses due to the reduction in fish catch. The growing situation of reduced fish catch and resultant loss in household income has further thrown households into debts as household heads are unable to meet basic needs such as paying for health care services and children school fees.

Despite the challenges faced by community members as a result of climatic issues, people in these communities mentioned some strategies used over the years to address the challenges. They mentioned that in the case of environmental disasters, they mostly rely on relief and support offered by government, relatives, non-governmental organisations and the National Emergency Management Organisation (NADMO). They mentioned that support from these organisations have not been consistent during environmental disasters in recent times. Also, support from close family members has become difficult because of unfavourable economic circumstance. In addition, is the burning of orange peels to repel mosquitoes during heavy rainfalls. The increased rainfall creates lots of breeding grounds for mosquitoes. They indicated that this method of repelling mosquitoes is still very effective even though, the recent preference is the use of insecticides, such as mosquito repellent sprays and insecticide treated net.

Project communities are well aware of the increasing trend of malaria and cholera in their communities. They also had a fair idea about the poor sanitation conditions in their communities. However, prevalent perceptions across the three communities prior to project's activities were that sanitation facilities in the community should be the main responsibility of city authorities. It was a daunting task for the project team introducing a shift in perception within these communities as the project was initially thought to be a 'lifeline' for addressing all of the problems faced by individual communities. However, through the wider participation of the various members of the steering committee a paradigm shift occurred in perception and

attitudinal change within these communities. A good instance is as mentioned in the previous section, where a monthly community-led sanitation exercise is currently undertaken.

Findings from the MPhil thesis (attached as Annex A) indicate that both the inter-annual volume of rainfall and the number of rain days have been on the increase in Accra over the past two decades. Although the volume of rainfall and the number of rain days was highly positively related with malaria, the number of rain days was more strongly and significantly correlated to malaria than the volume of rainfall. The study also found that incidence of malaria is both a function of socio-economic factors and climatic conditions. Furthermore, is the observations made by different households on changing rainfall patterns and increased incidence of diseases. Patterns noted include the decrease/increase in seasonal rainfall and the unpredictable onset of rainfall. Malaria was mentioned as an example of diseases on the increase due to the changes noted in climatic pattern. Strategies adopted on the household levels have already been enumerated in the previous paragraph. Instructively, is the increase in hospital visits and use of various forms of insecticides, suggesting an increase in household expenditure.

The PhD student is examining the empirical linkage between flooding, water and sanitation and diarrhoeal disease in the study communities. The preliminary analysis shows that there is a complex relationship between flooding and diarrhoeal disease using rainfall data from the Ghana Meteorological Service Department and morbidity data from the Ghana Health Service. The prevalence of cholera and non-cholera diarrhoea disease had no clear pattern with flood events in the study district over the last two decades. While in some instance the prevalence of diarrhoeal disease was high in flood years, in some, it was rather high during years that flooding was not experienced. A cross-sectional survey that was conducted in the communities indicates that sanitation is a challenge in the study communities with over sixty percent (60%) of residents in some of the study communities using public toilets and about 30 percent having no refuse bins in their homes. In terms of water, almost all the respondents have access to pipe borne water which are either located in their homes or less than 10 metres from their homes. More than half of the households rely on sachet water as their main source of drinking water.

2) To test risk communication strategies to recognize and monitor climate variability/change and related risks (health, water, sanitation, etc), through social learning and disseminate lessons through designed communication tools.

A radio programme was organised for representatives from the project communities to discuss climate change and its impact on their community on a community radio. The radio programme was organised in such a way that community members were given the opportunity to phone in and ask questions. Also, the project team through the community facilitators organised a climate change contest (drama, pictures and paintings) for school children in the communities as a way of assessing their knowledge of climate change and how they envision the future of their community. Further, there were distribution of posters and fliers on climate change education among school pupil and community members. These materials also depicted some of the findings of the project. There were also community dissemination programmes where project findings were discussed with community members.

The project was able to give adequate education on climate change to the people. The Schools that participated in the climate change drama pledged to form environmental clubs and follow-ups have been planned by project team to monitor progress of established clubs. The general notion in targeting schools is that pupils who benefit from the knowledge gained from the project's environmental education programme will in turn pass such knowledge to their parents and peers. A notable change in attitude is the recent acceptance of payment for solid waste disposal. Formerly, members of the communities were opposed to paying for household waste disposal, thus resulting to indiscriminate disposal of waste and its attendant heath problems. From the intervention of the project, currently, households now pay for their waste to be collected, thus, reducing the amount of waste dumped into drainage systems. Invariably, clear drainage systems reduce the level of flooding within the community. However, the current challenge is in the delay of refuse collection by waste management companies.

3) Research on climate change and health in urban environments.

The students on the project worked on the research component of the project with supervision from senior research members on the project. The MPhil student worked on the relationship between climate variability and malaria while the PhD student is researching on the association between flooding and diarrhoeal disease. Aside these theses, there are plans to publish some of the findings in high impact factor climate-focused journals, such as Regional Environmental Change to share with the larger scientific community.

3.0 METHODOLOGY

The entire project was based on a participatory action research approach. In order, to make the project more participatory, the research team asked project communities to nominate two representatives from their communities to be trained at the Regional Institute for Population Studies (RIPS), University of Ghana, on the tools to be used in data collection in the communities (reporting format in appendix 1). These community representatives acted as co-facilitators alongside the research team in all of the programmes that took place in all three communities. All the group meetings were done in the local language and this encouraged discussion among the participants. The specific methods that were used are as follows:

A three-part conceptual framework that combines risk mapping, mental models, and individual stressor cognition to address the first objective of the project. All the activities at this level were done separately for adult men, adult women and the youth ((appendix 2). First, we used participatory risk mapping activity (Quinn et al., 2003) to assess the various risks (i.e. health, water, sanitation, floods, high temperatures, etc) households face and their perceived severity. Participants were asked to free-list the various hazards they experience, rank them in order of importance, and determine the level of harm (severity). We also used mental models or conceptual maps of ideas (Bostrom et al. 1992; Zaksek and Arvai, 2004) to elicit cause and effect representations of climate variability/change, as understood by community members. Further, we used community focus groups and historical matrices (Freudenberger-Schoonmaker, 1995) to identify periods of extreme disease prevalence, water shortages, sanitation problems, and possible causes, including climatic stresses (drought, flood, hot winds, etc). Individual, collective, and institutional responses were recorded as well as their efficiency.

The second objective of the project was met through, working with local artists. They designed risk communication material (e.g. brochures, flyers, posters and photo competition; also, see appendix 3) and invited multiple stakeholders to initiate and participate in a radio program on climate change. Environmental theatre was also initiated involving community children to play skits on the impacts of climate change on health, water and sanitation. Focused semi-structured

interviews, pair-wise ranking and scoring were used to identify local and gender needs. In addition, the diversification of resource management and income-generating activities which could simultaneously enhance health, water and sanitation issues including adaptive capacity to climate change was prioritized. Finally, research findings were disseminated through writings and participation in international conferences on climate change (example, appendix 4A & B), open days in project communities, posters and radio programmes.

The third objective of the project is the research on climate change and health. Two students (1 MPhil student and 1 PhD student) were recruited and sponsored by the project to conduct research in the area of climate-change and health. The MPhil student completed her programme in 2011(Annex A) while the PhD student is near completion of his field work activities. The PhD candidate began his research work one year after the project had begun due to some registration anomalies encountered at the graduate school of the University of Ghana. He is expected to complete his PhD programme by December, 2013 under the aegis of the current IDRC Climate Change programme hosted by the institute. This is in line with the agreement reached with the IDRC programme officer in Dakar, Senegal.

4.0 PROJECT ACTIVITIES

4.1 Community entry and formation of project team

The first activity that was done under the project was an inaugural meeting involving all the project team members on Friday, September 17, 2009 at the conference room of the Regional Institute for Population Studies, University of Ghana, Legon. The agenda of the meeting was centred on the following; to discuss the project proposal especially on the methodologies to be adopted, the composition of a steering committee for the project and to suggest possible replacement of the original proposed community of Old Fadama, which at that time faced ejection threats from city authorities. The meeting agreed on the following stakeholders as the steering committee members: study communities, the National Disaster Management Organisation (NADMO), Accra Metropolitan Assembly (AMA), University of Ghana Medical School (UGMS), Ghana Health Service (GHS), Ghana Meteorological Service (GMS), Ga Mashie Development Agency (GAMADA) and the Environmental Protection Agency (EPA). It was also agreed at the inaugural meeting that each of the project communities and organisations on the steering committee nominate a representative to serve on the project steering committee. The steering committee was to periodically review project activities and offer advice on the way forward.

Subsequently, a reconnaissance of three recommended communities (Agbogbloshie, Sukura and Glefe) was made by the project team on the 25th of September, 2009, to find a suitable replacement for the old Fadama community. Of the three communities, Agbogbloshie was chosen as best fit, based on its striking similarities to old Fadama

The next major activity that was done after the inaugural meeting and reconnaissance was the 'Community Entry'. This event was to officially inform community opinion leaders about the project and also to collect information on the various interest groups within the three communities. Meetings were respectively, held in James Town (October 15, 2009), Ussher Town (October 20, 2009), and Agbogbloshie (November 8, 2009). At each of the meetings, community stakeholders, leaders, opinion leaders and representatives from identifiable group were officially informed of the project, the proposed activities to be undertaken, the expectations of the project

team, and project outputs. In turn, community members were given the opportunity to ask questions, and members of the team responded to the various concerns raised. The community representatives at the meeting welcomed members of the project team, and promised to work with the team to achieve the objectives of the project. In addition, community members were requested to select two people to be trained as local facilitators.

The project team subsequently held an inception workshop on Friday 20th November 2009, at the Mantse Agbona Park in James Town to officially launch the project. The launch was attended by Chiefs, opinion leaders, city authorities, members of the clergy, social groups, school children, and other members of the communities. These initial activities placed the project on a good footing to start its main research activities in the communities. The strong entry of the project into the three communities helped in curbing future data collection challenges that could have arisen if a proper entry was not done.

Prior to data collection activities, a two day training workshop was organised for six local facilitators who were selected during the community entry meetings. The selection was done by each of the three communities, and the following criteria informed their choice of facilitators: (a) the ability to communicate in English and the local dialect (b) availability to represent the community on the project and to moderate discussions in the community (c) ability to organise community members and (d) prior experience of working on a research project in the community. The selected facilitators were Vincent Adams and Alex Boakye (Ussher Town), Solomon Tetteh and Bilal Tackie (James Town), Anifatu Issaka and George Aziaduvor (Agbogbloshie). The aim of the training was to equip the facilitators with the necessary knowledge and skills needed for the project activities.

The training programme was organised on the 25th and 26th November 2009 at the computer laboratory of the Regional Institute for Population Studies, University of Ghana, Legon. There were presentations on Climate Change, the CC Health Project, Project Methodologies (including Participatory risk mapping, ranking and scoring; Mental Models; Historical Matrices; Household Surveys; Vulnerability Mapping); Local Climate Change Indicators; Social Learning Activities and the role of facilitators. The resource persons were Dr. Samuel Codjoe, Fuseini Kamil, Abu

Mumuni, Margaret Appiah, and Lucy Atidoh, all from RIPS. The activities of the community facilitators were supervised by Ga-Mashie Development Agency (GAMADA) - a community based organisation that deal with health and sanitation and other developmental issues within the project area. The monitoring and evaluation consultant and the RIPS team monitored the activities of GAMADA and the community facilitators.

The project benefited from the rich experiences of the community facilitators and GAMADA on different ways of approach to dealing with some key activities in the communities. For instance, the organization of project activities in the communities were scheduled in such a way that it did not conflict with livelihood activities of the people. Also, mobilizing the people for discussions was made easy and entry into difficult areas of the communities was facilitated by the community facilitators. In addition, the use of the local language by the community facilitators encouraged discussions among participants.

The project team held a meeting with the monitoring and evaluation consultant, Ms. Vicky Okine, chief executive of the Alliance for Reproductive health Rights, on 2nd December 2009 at the conference room of RIPS. She was briefed by the project leader on the aim and objectives of the project, why it was being undertaken in an urban area, the activities undertaken to date, and the role of the monitoring and evaluation consultant. She worked briefly with the project team and was later replaced by Mr. Emmanuel Obeng (Head of Monitoring and Evaluation, Adventist Relief Agency, Ghana) [see sample reports in appendix 5], because Of other engagements which conflicted with the RIPS assignment. The monitoring and evaluation consultant prompted the project team periodical and observed gaps in the implementation plan were promptly addressed.

It is important to mention that project equipments were purchased such as Toyota Fortuner 3000 CC diesel vehicle which assisted tremendously in the organisation of the numerous activities in the study communities. In addition, digital cameras were purchased and presented to each of the study communities for documenting evidence of climate change. Finally, three laptop computers were purchased for the project.

4.2 Mental Models

Another important activity that was done by the project team in the communities was mental models of climate change. The purpose of this exercise was to deepen understanding of the general stressors in the communities' inclusive climate change and its impact health, water and sanitation issues (appendix 6). These activities were undertaken in James Town on the 23rd and 24th January 2010, in Usher Town on the 30th and 31st January 2010 and at Agbogbloshie on the 21st February 2010. Climate change models depicted by different focus groups included the following: (1) Climate change is the changes in weather ; (2) Climate change has to do with the excessive heat; (3) Climate change is the inconsistency in our weather patterns in terms of rainfall; (4) Climate change - is nowadays the sun shines more excessively than it was; (5) Climate change - is changes in seasonal patterns in terms of rainfall and harmattan; (6) Climate change is the changes noted in the past and present times; (7) Climate change has to do with the hotness of the sun and other natural phenomena like earth quakes; (8) Climate change is when our industries release toxic substances into the atmosphere; (9) Climate change is the gross household waste (smoke) that we release into our environment and the bad effects it brings to us; (10) Climate change is the changes in our general weather conditions in terms of raining season and dry or harmattan season (11) In recent times there are drastic changes in our climate which makes it difficult to predict when it will rain and when it will not rain; (12) Climate change is the cutting down of trees for the construction of houses and settlements; (13) Climate change is when there is a change in the air in the atmosphere; (14) Climate change is about the disrespect of elders by the youths in the current dispensation.

The results show that community members have varying perceptions about climate change, and the project team used these concept maps of climate change as a support tool in the social learning process for each of the three communities. In the ranking of indicators of climate change, heavy rains leading to floods and extreme heat topped the chart. Heavy rain fall was mentioned by all the nine focus groups, while extreme heat was mentioned by eight out of the nine groups. The mention of heavy rain fall and extreme heat by the various groups is indicative of the importance of climate change as a stressor within these urban settings. Furthermore as indicative in the mean severity score (table 1), heavy rains/floods and heat were both given risk scores of 4 which meant that both climatic indicators are perceived as having severe

consequences on the communities. Other stressors mentioned were inadequate provisions of drains, inadequate refuse containers, unemployment and low fish catch.

Table 1: Community stressors

Stressor	Frequency	Mean severity score
1. Lack of refuse containers	9	5
2. Heavy rains/Floods	9	4
3. Heat	8	4
4. Unemployment	7	5
5. Air/Industrial pollution	5	4
6. Choked gutters	5	4
7. Crime	4	4
8. Lack of educational facilities	4	4
9. Mosquitoes/Malaria	4	3
10. Teenage pregnancy	4	2
11. Street markets	4	4
12. Lack of gutters	3	4
13. Overcrowding	3	4
14. Noise	3	3
15. Low fish catch	3	5
16. Pre-mix fuel	3	4

Source: Focus group discussions, 2009

In terms of the causes of climate change, participants mentioned the following: (1) Smoke from burning of tyres depletes the ozone layer leading to excessive heat which causes climate change; (2) Smoke from firewood which is the main source of energy for cooking; (3) Smoke from burning second hand clothes; (4) Cutting of trees; (5) Fumes from cars and industries, (6) Burning of electrical gadgets and copper wire; (7) Industrial Pollution: The companies in the community produce liquid waste which tends to pollute the community; (8) God has organised everything in the world to work the way He wants them to work. God is definitely the power behind climate change; (9) Stone quarries reduces rainfall; (10) Radiation from mobile phones; (11) Sand winning; (12) Chlorofluorocarbons emissions; (13) Traditional view point – It seems we have abandoned most of our traditional practices. We don't show respect to our gods any longer, to intervene on our behalf for rains and other things. Our way of living has also driven away our lesser gods. The outcome of all these is that, our gods no longer intervene on our behalf and this has affected changes in weather patterns. The priests that we know perform some rituals

prior to rainy seasons, harvesting season etc.; (14) Some of our fishermen tend to use chemicals for fishing and this affects the climate; (15) Use of explosives e.g., dynamites.

Data was also collected on the positive and negative impacts of climate change. This was done in relation to health, water, sanitation and other issues. The purpose for doing this was to further understand the views of the community members. For example, some community members were of the opinion that the appropriate time for refuse disposal was during heavy rainfall. Apparently, in their opinion the water from the rains acted as a transport medium for the refuse, hence heavy rains in this regard was considered a positive effect of climate change. However, the team clarified this malpractice through showing the linkages between blocked drains and flooding events. In response, participants agreed to mobilise periodically to clean drains in the community and also dispose waste properly.

4.3 Historical Matrices Approach

Historical matrices approach was employed to address the specific objective of establishing empirical linkages between changing climatic patterns and prevalence of diseases, water availability and sanitation provision. Thus, a historical matrix of past climatic events and diseases associated with these events were produced from focus group discussions. The importance of indigenous knowledge in the adaptation strategies adopted by varied communities has been emphasized in the literature. In line with this, the project documented some of the past strategies adopted by the older generation under extreme climatic events. Useful lesson were shared and with the younger group and the general population. This activity was done in all three communities and the details are as follows:

Agbogboloshie

The activity in Agbogbloshie was undertaken on the 30th May 2010 at the Community Centre. Participants included elderly men and women from 30 years and above who have lived in the community for at least ten years. Overall, eleven participants took part in the programme.

One of the extreme climatic event noted was the 1961 flood which lasted for 3 days. This event on the mean severity score table shown in the preceding section was given a score of 4. The impact of the floods resulted in the following casualties and loss: (i) Loss of animals (goats, sheep etc.), (ii) Loss of properties, (iii) People got injured,(iv) People's rooms were filled with water.

Coping strategies adopted included: (i) Temporary shelter offered to affected persons by families and friends, (ii) Emigration from the community by people unable to cope with losses. On whether the coping mechanisms were efficient, the response was "No" and the reason was because the flood created a lot of inconveniences in the community. The participants were asked to state what they would have done if they knew the event was going to occur. The responses are as follows: (i) Clear water ways, (ii) Store enough food, (iii) Move out of the community, (iv) Educate community members on the event. Participants were further asked if the coping mechanisms they adopted will work today if such an event reoccurred. They responded in the negative and stated that (i) People living at the lower part of the community are more than those on the higher grounds implying the non-availability of temporary shelters in the event of an extreme event.

The participants stated that no institution came to their assistance during the extreme event mentioned and they were quick to enunciate on the need of disaster relief measures from the government/district commissioners during such disasters. The lack of assistance from government they further enunciated was based on the ejection agenda of the then government. Plans had already been made by the government to resettle people in the Agbogbloshie community in the 1960s, in view of setting-up viable industries within the area. However, due to the military coup in 1966 that ousted the civilian rule, these plans were put on hold.

The second extreme climatic event recounted was the 1995 floods, lasted for two days. And in terms of severity was given a score of 3 out of 5. Participants recalled some of the impacts of the flooding event. Importantly was the fact that several buildings collapsed, resulting in the loss of lives. In addition they narrated the loss of income and resultant hardship experienced by different households, including cases of hunger and starvation.

In contrast to the 1961 event, the government agencies, such as the National Disaster Management Organsiation (NADMO). responded with relief items such as blankets, bed sheets and food items. Coping strategies they recounted during the period were effective, however the sustainability they asserted was short-lived. They were asked what they would have done if they knew the flood event was going to occur. They stated the following: (i) Stop people from

building on water ways, (ii) Encourage Town and Country Planning Department to do their work well, (iii) Form committees to ensure that the proper things are done. On whether the coping mechanisms would work today if such an event occurred, they stated, "No". Reasons proffered include the lack of enforcement of proper building permits, particularly the compromising stance of some government officials in granting buildings on waterways. In addition was the indiscriminate waste disposal into drainage systems. Community members were however, of the opinion that institutions such as Accra Brewery Limited, the Graphic Corporation and churches that are close to the community should have also come to their aid.

The final extreme climatic event mentioned was a Drought in 1983 which lasted for one and a half years. Community members gave it a severity score of 5 out of 5.The impacts included: (i) People fell sick, (ii) People died and (iii) People lost their jobs (because people had nothing to sell). Coping mechanisms were enumerated as follows: (i) People had to eat food's they were not used to (e.g., mixing gari (processed cassava flour) with hard coconut, yellow corn, pig feet, r , oyster and dead crab etc.,), (ii) People sold their properties to buy food (iii) People had to buy uncooked food and bread, (iv) People were forced to eat food they abhorred, (v) People had to steal from farms belonging to other people Participants narrated their inadequate preparedness for the drought as it was an unexpected occurrence. Coping strategies in the case of a reoccurrence enumerated by participants include the necessity of saving money, food and medicines. However, in their view, the coping mechanisms would not work today because of the following: (i) The population is now very large (ii) People have very bad intentions and could sell poisonous food which could lead to more deaths. (iii) People may sell sex which can lead to an increase in sexually transmitted diseases.

James Town

A similar activity took place in James town on the 29th May 2010 at the Premises of the Chief Fisherman. Participants included elderly men and women 30 years and above resident in the community for at least ten years. In all seventeen participants took part in the programme.

One of the extreme climatic events that mentioned was a flood in 1979 which lasted for two months and was given a severity score of 4 out of 5. The impacts were: (i) Destruction of roofing

sheets (ii) Loss of properties, (iii) Massive flooding in the entire community (iv) Increase in mosquitoes. Measures used to cope with the floods and its impacts included: (i) Burning of orange peels and palm branches to drive away mosquitoes. On whether the coping mechanisms were efficient, the response was "Yes, and somehow efficient" and they added that the coping mechanism was sustainable. The participants were asked to state what they would have done if they knew the event was going to occur. The responses were: (i) Open-up waterways in the form of gutters to prevent flooding (ii) Store enough food, (iii) Reinforce buildings. Participants were further asked if the coping mechanisms they adopted would work today if such an event reoccurred. They responded in the affirmative. Although participants indicated that their coping mechanisms would be effective, one is of the view that burning of orange peels and palm branches is still effective in driving away mosquitoes, however, the question is how many people in an urban setting will employ this method. In addition, the smoke that comes out of this could have health implications for the people. Finally, the participants stated that the Government through the Ministry of Health came to their aid but added that traditional leaders and churches should have also come to their aid.

In consonance with the Agbogbloshie community there was a flood event in 1995 that lasted for three days. Participants rated the event as severe, by scoring4 out of 5. According to the participants, there were destruction of canoes, roads, cars and loss of stored fish. The government constructed drains in the community, repaired their canoes and ensured that the drains were kept clean for free flow of water. They were of the opinion that the coping mechanisms were efficient. On the issue of whether the coping mechanism sustained them, they stated that it sustained them only for the period of the disaster. They were asked what they would have done if they knew the flood event was going to occur. They stated the following: (i) Sleep on the shore and (ii) Increase the weight of the anchors on their canoe. On whether the coping mechanisms would work today if such an event occurred, they stated, "Yes". According to the community members, no institution came to their aid during the disaster, however, they suggested that research institutions and the National Disaster Management Organisation (NADMO) should have assisted them.

In 2003 there was Wind storm in the community which lasted for a period of three weeks and was given a severity score of 4 out of 5. According to the participants, there was destruction of canoes and fishing nets as well as roofing sheets. Community members stated that they used plastics or rubbers as roofing sheets and durable ropes to tie their canoes to prevent them from being washed away. In their opinion, the rubbers used as roofing was not so effective however, the ropes tied to their canoes was very efficient. They were asked what they would have done if they knew the wind storm will reoccur. They stated the following: (i) Plant coconut trees (ii) Increase the weight of the anchors on their canoe, (iii) Stop people from cutting down trees at the shore (iv) Educate people to design their canoes to withstand storm, (v) Sleep at the banks of the shore to be able to save their canoes in the event of a storm. On whether the coping mechanisms would work today if such an event occurred, they stated, "Yes". According to the community members, a lot of education on how to protect their canoes from being carried away by the wind storms has been done so most people are aware of what to do under such circumstances. Furthermore, they stated that no institution came to their aid during the disaster; however, they are of the opinion that the Ministry of Fisheries and the National Disaster Management Organisation (NADMO) should have assisted them.

The final extreme climatic event mentioned in James Town was the 1983 Drought which lasted for over a year. Community members gave it a severity score of 5 out of 5. The impacts included: (i) Loss of lives (ii) Loss of properties (iii) Looting of properties. (iv) Health related problems. Coping strategies included - the following: (i) People had to eat food's they were not used to (e.g., palm kernels, coconut, banku crackers) and (ii) Barter. The government and the United Nations came to their assistance. However, they believed that churches and traditional leaders should have also assisted them.

Ussher Town

The activity took place on the 29th May 2010 at the Usher Town Gardens. Participants included elderly men and women 30 years and above who had lived in the community for at least ten years. In all twelve participants took part in the programme.

The community was said to have experienced flooding in 1955 which lasted for three days and was given a severity score of 5 out of 5. The impacts were: (i) Collapse of schools and houses (ii)

Loss of properties (household items, livestock), (iii) Loss of lives (iv) Destruction of roads. Measures used to cope with the floods and its impacts included: (i) Use of canoes to rescue people (ii) Climbing to the top of storey buildings (iii) Moving from low lying areas to high lands (iv) Desilting the major drain, i.e. the Korle Lagoon to allow free flow of water. On whether the coping mechanisms were efficient, the response was "Yes, and sustained them only during the event. The participants were asked to state what they would have done if they knew the event was going to occur. The responses were: (i) Move to high areas (ii) Store enough food. Participants were further asked if the coping mechanisms they adopted would work today if such an event reoccurred. They responded in the affirmative. They were of the view that the coping mechanisms helped save a lot of lives and they have used them during subsequent flooding events. The participants stated that the Government at the time did not assist them in any way and the President of the time, Dr. Kwame Nkrumah only came to the area to observe the event. They however stated that the government and non-governmental organisations should have assisted them.

There was also a flood event in the community in 1963 and it lasted for a period of three days, and was given a severity score of 5 out of 5. According to the participants, there were destruction of streets, properties, and roofs. Measures used to cope with the floods and its impacts included: (i) Use of canoes to rescue people (ii) Climbing to top of storey buildings (iii) moving from low lying areas to high lands, and they were of the opinion that the coping mechanisms were efficient. On the issue of whether the coping mechanism sustained them, they stated that it sustained them only for the period of the disaster. They were asked what they would have done if they knew the flood event was going to occur. They stated the following: (i) repair their roofs (ii) construct a very good drainage system (iii) store food (iv) stop children from going to school during the period. On whether the coping mechanisms would work today if such an event occurred, they stated, "Yes". According to the community members, no institution came to their aid during the disaster, however, they are of the opinion that the government (Municipal Assembly) should have assisted them.

The third flood event mentioned occurred in 1995. It lasted for three days and was given a mild severity score of 3 out of 5. According to the participants, there were destruction of small kiosks,

properties and buildings. People were said to have lost their lives. Community members stated that they used canoes to rescue people and they were moved to storey buildings and roof tops. They were asked what they would have done if they knew the flood event was going to occur. They stated the following: (i) Move properties to other communities (ii) Clear waterways, (iii) Leave waterlogged areas. On whether the coping strategy would work today if such an event occurred, they stated, "Yes". Furthermore, they stated that the National Disaster Management Organisation (NADMO) and the Red Cross provided blankets, roofing sheets and other relief items. They added that the international community and non-governmental organisation should have assisted them.

The final extreme climatic event mentioned in Usher Town was the 1983 Drought which lasted for a year. Community members gave it a severity score of 5 out of 5. The impacts included: (i) Loss of lives (ii) Cholera outbreak (iii) Other Health related problems (iv) People sold personal belongings to buy food. They coped through the following: (i) Food aid (ii) Queued for long hours to buy food. If community members knew this event was going to occur they would have stored food. The government, UNICEF, USAID, ECOWAS, international community and other non-governmental organisations came to their aid.

4.4 Local climate indicators

This particularly addresses objective two (2) under the specific objective item enumerated in the objective section. The project had the initial intentions of creating a local level early warning system, using unique identifiable indicators from each community. Additionally, this initiative was to be community driven with daily recordings on the identifiable indicators entered into a centralized system. However, community members were not too enthused about the activity. As a result, the projects objective of establishing an early warning system in the community was not achieved because people in the community were not prepared to feed the community facilitators with information that will enable them to document the validity of the local climate indicators. It was also observed that community members were already making use of weather forecast that are provided by the Ghana Meteorological Service Department and so were not motivated to develop a separate warning system. In addition, the information Service Department do provide the community with information on possible environmental hazards that enables them to prepare towards such eventualities. However, local indicators for monitoring climate change and related

risks were generated through focus group discussions. An attempt was made by the project team to monitor these signs through information from community members but this did not work due to lack of interest on the part of community members. But, participants at meetings organised by the project team indicated that these local indicators still serve very good purposes to them. However, results of these exercise and indigenous knowledge of climate variability and change were presented as a side event during Conference of Parties (COP) 17 meeting by the MPHIL student (appendix 7)

In Agbogbloshie, the activity took place on the 30th May 2010 at the Community Centre. The following were the indicators discussed:

Table 2: Local climate indicators in Agbogbloshie

Indicator	Sign	Period (Month)	Outcome
Frog	The sound of frogs anytime in June	After hearing the sound, the rain is usually expected within 2 to 3 days	This usually results in rainfall which could either be normal or very heavy.
The Sun	When the heat from the sun is unusually hot with very high temperatures in June/July	The very day the observation is made in June/July	Normal rainfall
Ant	Ants usually prepare for the rainy season by looking for food to store in their holes. When ants are seen carrying food into their hole in May/June	April/May	Heavy rains usually in a week or two
Cattle Bird	They move in groups and anytime they are spotted	May/June	Heavy rainfall
Moon	When the moon becomes dark, it is an indication that it will rain in the evening. However, if the moon is bright it is an indication that it will not rain	May	Normal rainfall
Rainbow	When the rainbow appears after a rainfall event, it indicates the end of the rain for that day.	Any time in the year	No rains for 3 to 4 days in major rainy season (May, June, July) and indication of onset of dry season when it appears in November.

Cloud	Dark clouds moving from the east to the west.	Usually in May and June. It can also occur at anytime	Normal rainfall

A similar programme was organised in James Town on the 29th May 2010 at the Premises of the Chief Fisherman. The following were the indicators discussed:

Table 3: Local climate indicators in James Town

Indicator	Sign	Period (Month)	Outcome
Cloud	When the clouds are dark	May , June, July	It usually results in rain
Ant	When red ants are seen moving in a particular direction	May , June, July	This is an indication that the raining season is approaching
Herrings	The harvest of Herrings	May to August	Good rains in the year
Temperature and the colour of the sea	The Sea becomes very cold and the colour is deep blue	July to August	Bumper fish harvest
Wind	Strong winds from North to West with strong lightning and thunder	June/July	Heavy rains with good fish catch.
Whale	When a whale is caught	May to July	Good fish harvest
Sea	Sea becomes muddy and consists of slimy creatures called "Nshoomli gugo" literally translated to mean "sea phlegm"	June to July	Good Harvest (fish)

The programme was also held in Ussher Town on 29th May 2010 at the Usher Town Gardens. The following were the indicators discussed:

Table 4: Local climate indicators in Ussher Town

Indicator	Sign	Period (Month)	Outcome
Ant	When ants are seen moving in chain and carrying food into a safe place	May/June/July	Onset of rainy season
Wind	When cold wind is blowing from the east to the west	May to June	Rains follow immediately
Cattle Bird	A large number of cattle birds fly around during gentle winds and then disappear when the winds become stronger	May / June	Normal Rains
Clouds	Dark clouds in the evenings amidst some thunder	Anytime	Bad weather conditions at sea and low fish catch
Crow	A large number of crows flying from the east	May/June/July	Heavy rains

4.5 Household Interviews

The project collaborated with the EDULINK PopTRCD Project at RIPS to conduct household interviews from Tuesday, June 8th to Wednesday, July 7th, 2010, after three weeks of interviewers training. Overall, five teams, each comprising one supervisor, one editor and five interviewers were involved in the data collection exercise. The survey was conducted in the three project communities - James Town, Ussher Town and Agbogbloshie.

The sample was drawn from 29 enumeration areas (EA's), each with 20 households systematically chosen to make up a total sample size of 580 households distributed over the three localities. The number of EA's and therefore, households in each locality was proportionate to the population size of that locality. There were five EA's from Agbogbloshie, eight from James Town and sixteen from Ussher Town. The aim of this sampling procedure was to arrive at a survey with 500 households interviewed. Estimates from the Ghana Statistical Service indicated that the non-response rate in the Greater Accra Region is about 15%, and so adding an extra 15% of households to the 500 aimed at led to the figure of 580.

The research team worked six days a week- from Saturdays to Sundays, and Fridays were the day of rest for the team. Usually, two buses picked up team members beginning at 6:00 am every morning; the team would arrive in the field by 7:30 am, work until about 3:30 pm and then be returned to the various pick-up spots. The team worked in James Town from June 8th to 14th, in Ussher Town from June 15th to 29th, and in Agbogbloshie from June 30th to July 7th.

4.6 Questions on Climate Change and Health

Specific questions were asked on climate change and health. The questions are as follows: (1) What months of the year does it rain in this locality? (2) Has this been the same ever since you came to live in this locality? (3) How would you describe the current rainfall pattern compared to the previous patterns? (4) What about the temperature pattern currently compared to the previous pattern? (5) Have you experienced any flooding events in this community? (6) If yes, state years (7) What are the commonest diseases in this community? (8) Are the common disease(s) in this community related to the rainfall/temperature pattern here? (9) If yes, which of them? (10) Are you currently experiencing sea erosion in this community? (11) If yes, describe it (12) How does this affect your health? (13) How does this affect your livelihood? (14) How much of a problem is deterioration and poor sanitation in your community? (15) What is the main source of drinking water for members of your household (16) What kind of toilet facility does your household use? (17) What are the main environmental problems faced by your household in this community? (18) What are the coping mechanism your household adopted to resolve these problems? (19) What are the losses encountered by your household as a result of these environmental problems?

4.7 Challenges in the Field

It was realized that the number of eligible household members was lower than had been anticipated before fieldwork. It had been estimated that there would be three to four eligible adults on average in each household but there were in fact, less than two eligible persons in each household on average. The total number of individual interviews conducted was a little under eight hundred. There were a few instances (about 5 in total), where structures that had been listed as dwelling units were found not to have anyone actually sleeping in them. In other cases (again about five cases), some temporary structures which had been dwelling units during the listing exercise two months earlier had been moved from their previous locations. Some structures which had had only one household living in them during the household listing exercise now had more than one household living in them. It had been agreed that in such cases, since it was the structure, and not the individual who had been sampled, both, or all of the individuals/households now living in the structures would be interviewed. There were also some hard-to-find persons. In some instances, eligible respondents had to be followed up to their places of work, or had to be interviewed very early on weekend mornings, or after they returned home from work.

4.8 Interview Statistics and Response Rates

In the tables below the statistics concerning completed household and individual interviews and non-response, as well as reasons for non-response are presented. Tables 5 to 7 present figures for each of the three localities whilst Table 8 has sums and response rates for all three localities.

Table 5: Agbogbloshie

Agbogbloshie						
EA No.	**1**	**2**	**3**	**4**	**5**	**Total**
Household interviews completed	15	16	15	20	16	**82**
Individual interviews completed	25	38	20	32	17	**132**
Household interviews refused	2	0	1	0	1	**4**
Individual interviews refused	0	1	0	0	1	**2**
Households absent	1	4	0	0	3	**8**
Individuals absent	2	4	3	2	3	**14**
Households not found	0	0	3	0	0	**3**
Vacant dwellings	2	0	0	1	0	**3**
Individual interviews partly completed	0	0	0	0	1	**1**

Table 6: James Town

James Town									
EA No.	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**Total**
Household interviews completed	19	20	19	17	17	18	16	21	**147**
Individual interviews completed	29	30	22	25	21	23	18	29	**197**
Household interviews refused	0	0	0	3	0	0	0	0	**3**
Individual interviews refused	1	0	0	1	0	1	0	2	**5**
Households absent	1	0	1	0	1	2	3	0	**8**
Individuals absent	4	4	5	1	3	3	1	0	**21**
Households not found	0	0	0	0	0	0	1	0	**1**
Vacant dwellings	0	0	0	0	0	0	0	0	**0**
Households partly completed	0	0	0	0	1	0	0	0	**1**
Structures removed	0	0	0	0	1	0	0	0	**1**

Table 7: Ussher Town

Ussher Town																	
EA No.	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**Total**
Household interviews completed	15	18	17	16	18	16	18	17	18	13	18	16	19	18	14	18	**269**
Individual interviews completed	22	23	21	26	44	22	23	30	26	24	24	22	28	31	25	30	**421**
Household interviews refused	0	1	0	2	0	0	1	0	0	3	0	1	0	0	0	0	**8**
Individual interviews refused	0	0	1	6	1	0	0	0	1	2	0	0	1	0	1	0	**13**
Households absent	3	1	2	1	2	1	0	3	0	0	2	1	0	1	2	2	**21**
Individuals absent	7	0	2	2	1	0	3	2	1	1	4	5	1	0	3	0	**32**
Households not found	2	0	0	2	0	2	0	0	1	0	0	2	0	1	1	0	**11**
Vacant dwellings	0	0	0	0	0	2	0	0	1	3	0	0	1	0	2	0	**9**
Individual interviews partly completed	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	**2**
Household Invalid (single member household)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	**2**
Structure removed	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**

Table 8: Summary of Statistics and Response Rates for Various Localities

Locality	**Agbogbloshie**	**James Town**	**Ussher Town**	**Grand Total**
Household interviews completed	82	147	269	**498**
Individual interviews completed	132	197	421	**750**
Household interviews refused	4	3	8	**15**
Individual interviews refused	2	5	13	**20**
Households absent/ not found/ vacant/ removed/ partly completed/ incapacitated	14	11	44	**69**
Individuals absent/not found/partly completed	15	21	34	**70**
Household response rate (%)	82.00	90.00	84.00	**85.57**
Individual interview response rate (%)	89.00	88.00	89.96	**89.29**

The survey data provided an opportunity to examine the empirical relationship between climate change, water and sanitation and health implications in the study communities. It showed that majority of the inhabitants in the study communities are low-income people who live in an environment challenged by sanitation and health issues. The data helped to examine how poor urban neighbourhoods are vulnerable to environmental challenges and the implications of this for

the health of the population. Beyond this, the data was used to establish the relationship between climate variability and malaria in the study communities, as results formed the central thesis of the MPhil candidate, who completed her dissertation as earlier mentioned in 2011.

Additionally, the survey data contributed in building research capacity of the institute's MPHIL and PHD students, as students were given hands-on training on quantitative survey methods within climate change science.

4.9 Building a platform to address community concerns

One of the objectives of the study was to apply the Participatory Action Research approach in addressing problems of the study communities. This was done to ensure that the issues addressed were community-driven and not imposed by the project team. Thus, series of meetings were held with community and steering committee members. The aim was to report findings from focus group activities undertaken during the first year of the project, and to validate findings with community members. This was to help in the designing of programmes for subsequent activities. This exercise also gave the opportunity to bring together opinion leaders in the study communities and policy members to dialogue on the process of addressing problems within the communities. The first meeting took place on Wednesday 11th August 2010 at the conference room of the Institute of Statistical, Social and Economic Research (ISSER), University of Ghana, and the last two meetings were held at the conference room of the Regional Institute for Population Studies on 18th and 25th November 2010.

Community meetings were also organised in each of the study communities to report back project findings to members of the communities. The meetings were held on 17th, 19th and 21st December 2010 at James Town, Agbogbloshie and Ussher Town, respectively. The main aim of this exercise was to report back to the larger community and to receive feedbacks on the responses made by earlier community representatives.. These meetings facilitated the process of addressing the challenges in the communities since most of the steering committee members were in the position to influence change in the communities.

4.10 Training of CCHEALTH facilitators on how to monitor and report on climate change activities in the communities

As part of the second phase of the CCHEALTH project, a one day training workshop on how to monitor and report on climate change activities in the project communities was organized on February 24, 2011 for all the community facilitators and representatives of Ga Mashie Development Agency (GAMADA). The training was held at the conference room of GAMADA and was facilitated by the Monitoring and Evaluation Consultant (Mr. Emmanuel Obeng) on the CCHEALTH project. GAMADA was able to link the project with YES GHANA, a community-based organisation which was interested in refuse management in the communities. Even though, YES GHANA has now folded up in the communities, a similar group called Great Thinkers, set up by the youth, based on some outcomes from the project have taken over the sanitation management of the community. To date a minimum of three committees have been set up by the community facilitators to enhance environmental education and clean-up activities.

4.11 Prioritisation of Adaptation Strategies

The next activity undertaken was community prioritisation exercise. The objective was to engage the various communities to rank their preferred adaptation options according to importance. The methodologies used in undertaking this exercise were:

a. Pair-wise ranking and
b. Cross-impact analysis

4.12 Pair-wise ranking and Cross-Impact analysis

These activities were, conducted between the 5th and 20th May 2011 in the three project communities. There were twelve participants each in three different groups, i.e. youth, male- and female adults. The main aim was to prioritise the activities previously mentioned that could help address the impact of climate change on water, sanitation and health.

The pair-wise ranking is conducted among a group of individuals with a common interest. A minimum of eight and a maximum of fifteen participants are involved in this activity. Each target group is presented with 6-8 possible climate change adaptation options for health, water and sanitation. Each strategy is then compared with another for all the adaptation options presented. Hence, the target group, has the chance of selecting one out of two strategies presented at a time

for a given climate scenario. At the end of the exercise, the best three (3) options based on a unanimous decision are then retained for the next level of analysis.

The second level is the cross-sector impact analysis. This stage compiles the best three strategies from the pair-wise ranking for all the target groups in the various communities. Each of the groups is represented by three individuals and the group will have a maximum of nine adaptation options to select from. The selected participants from each group (youth, adult male and adult female) assessed whether the best strategies that were identified by each group have synergistic effect (reinforce each other) or have negative impact on each other (undesirable side effects). This is done by taking one adaptation option and comparing it with another option. The group is then asked: does adaptation option "A" have a negative or positive impact on adaptation option "B" if it is to be implemented considering water, sanitation and health issues in the community. The answer to the question is scored as follows: 0= no impact; 1= slight positive impact; 2= strong positive impact; -1= slight negative impact; -2= strong negative impact. Scores for each adaptation option is then summed up for final interpretation.

The outcome of the pair-wise ranking and cross-impact analysis in the various communities is presented in Table 9.

Table 9: Pair-wise ranking and cross-impact assessments by study area and group

	Adult Male	**Adult Females**	**Youth**	**Cross impact analysis**
Agbogbloshie	1. Proper disposal of waste 2. Education on climate change 3. Clean up exercises	1. Proper disposal of waste 2. Good drainage 3. Good toilet facility	1. Proper disposal of waste 2. Water harvesting 3. Good drains	1. Education on climate change 2. Proper disposal of waste 3. Clean up exercises
James Town	1. Education on climate change 2. Good toilet facility 3. Good drains	1. Good toilet facility 2. Recycling of waste 3. Water reservoir	1. Education on climate change 2. Good toilet facility 3. Recycling of waste	1. Education on climate change 2. Recycling of waste 3. Water reservoir

Usher Town	1. Education on climate change 2. Cleaning gutters 3. Water harvesting		1. Education on climate change 2. Cleaning gutters 3. Tree planting	1. Education on climate change 2. Water harvesting 3. Cleaning gutters

4.13 Climate change community Drama

A climate change community drama was organised for schools in James Town, Ussher Town and Agbogbloshie on Friday 13th July, 2012 (Annex B). How climate change is understood, interpreted, envisaged or explained by individuals across the world require education and campaigns in order to eliminate ignorance on the issue and its impact both on humans and the environment. The targeted schools were Bishop School of Accra (Accra High School), Private Odartey Lamptey School and Richard Aquaye Memorial School.

The project team carefully chose to use community theatre methodologies to educate people on climate change. The drama was conducted in the local language and each participating school rehearsed for the programme under the supervision of Rev. Dr. Elias K. Asiamah (a lecturer at the school of performing arts), University of Ghana. Each of the participating schools independently developed their story line with coaching lessons received from Dr. Asiamah. Prior to the performances, students were given some basic tutelage and information on the causes of climate change, the challenges of climate effect and the ways of mitigating climate change.

The drama by the students featured some of the challenges of climate change such as, poor crop yields which puts farmers and their households into very difficult situations. As depicted by the school drama, farmers in the bid to seek answers to changes within their environment, resort to traditional consultations with priests to ask forgiveness from their ancestors. This is premised on traditional beliefs and explanations to the late onset of rains for instance is seen as a punishment from the gods. Other scenes witnessed at the students performance included the adverse effect of practices such as bush burning and cutting down of trees. Also, showcased was the health consequences of indiscriminate disposal of waste and conflicts that arise when people try to address these issues in communities. Video versions of the play are attached to this report.

5.0 PROJECT OUTPUT

The following are the outputs on the Climate Change and Human Health Project in Accra over the project period:

Two students (1 PhD and 1 MPhil) were sponsored on the project. The MPhil student has completed her course successfully and has been awarded her degree. A copy of her dissertation titled "Climate Variability and Health Vulnerability in Accra: A case study of Ga-Mashie**"** is attached to this report. The PhD student on the project was only able to register in January, 2011 and so he still has some time to complete his work. He has made progress on it by successfully defending his proposal and gone to the field for further information on his work. A copy of his work will also be made available to IDRC when he completes his programme in December, 2013.

The following are papers in progress by the research team at RIPS and the IDRC will be given a copy when they get published.

- *Building Resilience to Climate Change through Adaptation: the Role of Indigenous Knowledge*
- *Climate variability and health vulnerability in Ga-Mashie Accra, an implication for occupational health*
- *Using Mental Technique to understand how rural and urban dwellers perceive climate change*
- *Vulnerability to Environmental Challenges in Poor Urban Neighbourhoods in Ghana: Implications for Health*

Establishment of compost plant in James Town through the initiatives of community facilitators based on the knowledge they gained from the project. The community facilitators formed a community development association and lobbied CHF for the facility in the community. This initiative has provided employment for some of the youth in the community and serves as a place where some household waste is disposed.

Training of community facilitators. In all, 6 community facilitators were trained on the project methodologies and monitoring and report writing. The community facilitators have so far been involved in other climate change activities being undertaken by RIPS and other organisations. Also, some of the facilitators have become climate change ambassadors in their communities based on the knowledge they gained from the project.

So far, one of the community facilitators (Solomon Tetteh) has enrolled at RIPS to do a Master of Arts Programme in Population Studies with the aim of doing his research in the area of climate change and health.

Dissemination of findings of project through durbars in project communities and also posters on climate change and health has been distributed in the project communities. This created awareness about what was happening and what is needed to be done as a community.

Radio programmes have been organised for community members as a platform to discuss climate change issues in their communities. The activity was done at a community radio station and it generated a lot of interest on the project by the community members.

The launch of the Climate Change and Human Health Project in Accra which was aired on major national media channels including television generated a lot of public interest. As a result, project leader was invited to participate in a TV discussion programme on climate change in Ghana. A section of the audience who phoned during the discussions stated that they have been provided with useful information on climate change.

The members of the steering committee on the project have been very useful. For instance, they were very instrumental in addressing a sanitation problem between the Accra Brewery and the Agbogbloshie community. Additional members have been involved in several other fora to chart a sustainable pathway for addressing climate change issues within these communities.

The project has video output of all the environmental theatre that was staged by schools in the project communities. These play provided information on the challenges of climate change in the communities and possible ways to address the issues.

6.0 PROJECT OUTCOME

Community problems were identified and climate change related problems were found to be embedded in the community problems. The climatic challenges that they mentioned were flooding, increasing temperature and sea level rise. The participating communities related these problems to the increasing trend in certain diseases (malaria, diarrhoeal, typhoid fever, skin rashes) in the communities. It also revealed that poor sanitation in some neighbourhoods in the communities facilitated the transmission of certain diseases.

Prioritised adaptation options for the communities have been identified. In all the communities, climate change education came up as an issue that community members would want to undertake. So far, the project team held some community dissemination programmes and also had some radio programmes in the communities to report back on events happening in the communities. This also served as an educational platform on climate change to the general populace within these communities.

The climate change and human health project has been the source of the current IDRC sponsored project at RIPS – Climate Change Adaptation Research Training Capacity for Development of the African Adaptation Research Centre of Excellence (AARC) project. It has also contributed to a recent project – climate and development knowledge network (CDKN) innovative project in coastal urban areas in Ghana. The information gathered in the project communities provided the opportunity for the research team to compete for additional funding to address some of the research gaps identified.

The establishment of a compost plant in Ga-Mashie through the initiative of some community facilitators on the project is a remarkable activity in the project communities. So far, this has generated some employment for some youth in the communities and it has also help to manage household waste in the area. It is a sign of how community members could take their own initiatives and sustain the goals of the project by continuing to work for the benefit of their community.

The assembly members in the communities in collaboration with unit committee members have been able to bring together groups and associations in the communities to take up clean up exercises in the communities. The main idea behind this was to keep the drains clean so as to ensure that when it rains the drains don't get choked to prevent easy passage of water. There have also been efforts to create water channels in the communities by some people especially in the Agbogbloshie community.

There is awareness created on climate change and its health impacts in the communities. Study communities have taken the lead through their assembly representatives to have their voices heard at Metropolitan Assembly meetings where major developmental decisions are made. Also, the steering committee members have raised issues confronting the study communities at very important meetings, building on the awareness creation agenda in these communities.

The MPhil students successfully wrote her dissertation using data collected by the project team. Her dissertation was passed in 2012 and she has currently enrolled into a PhD programme at the institute. Due to the delay in the start of the PhD candidate on the project, the candidate defended his proposal to the faculty in July, 2012 which was accepted and he is currently on the field collecting additional data for his dissertation. He should be done with his work in December, 2013 and progress of his work will be reported to IDRC through the AARC project at the institute.

The formation of a project steering committee and the use of community facilitators in this project contributed to the success of the project. Because of the nature of the study communities which has characteristics of urban slum with very poor inhabitants who are mostly thinking of where the next meal maybe coming from, makes organising such people for an activity very cumbersome. However, the idea of the community facilitators made it possible to always bring the people together to discuss an issue. Also, the steering committee members have been very instrumental in getting some issues addressed in some of the communities through their participation in the project activities and also having the opportunity to meet the community members to listen to their story.

7.0 OVERALL ASSESSMENT AND RECOMMENDATION

The objectives of the project have been achieved but with delays in some activities. All the communities showed a lot of enthusiasm in the project from the start to the end. The participatory action research approach was excellent because communities are able to identify individuals to lead them to get to specific offices where they think their problems could be addressed. It is important to note that, government response to the need of the communities have been very slow. For instance, the project team has for the past two years been looking for an opportunity to address the Accra Metropolitan Assembly on some of the research findings from the project. The Assembly is where major project decisions concerning the metropolis are taken. The project team was of the view that addressing the Assembly will create some awareness among policy makers on what is happening in the communities and possibly bring about some interventions. Although, the project is ended, the research team is still pursuing this agenda and it is hoped that it will be accomplished under the CCARTCD project.

Health policies in congruence with proper urban planning and multi-sectoral consultation are needed within these communities, if the impact of climate change on health is to be addressed. Health challenges of these communities are sometimes beyond the scope of operations of the health sector. For instance the structural planning of the communities and the drainage systems requires the services of city planners and engineers to be involved in addressing the issue. In most instances, the health outcome is usually the aspect that is often reported to the neglect of the fundamental causes of the problem. It is therefore, important to find a suitable way of addressing some of these indirect casual agents in health policies.

The project was impactful in its awareness creation drive on climate change and its impact on health, water and sanitation in the communities. The involvement of school children in the programme is a potent method of extending the message to every household in the community. The school children learnt a lot of lessons on climate change during their rehearsal sections which enabled them participate in the drama competition that was organised for selected schools in the communities. The teachers of the participating schools were involved in the programme and were encouraged to continue with the discussions on the impact of climate change on health,

water and sanitation with their students even after the drama competition. The project team at RIPS plans to follow-up on these with the schools.

The participatory research approach adopted by the project brought to fore the problems of climate change impacts within these communities. Hence, the project team were constantly faced with proffering solutions to these problems. The team did its best through the project steering committee members to get issues that didn't involve financial commitments addressed in the communities. The project team would have wished funds were available to undertake some projects in the communities. However, by identifying the preferred adaptation options in the communities, the project team intends to source for funds to support these adaptation options.

Both Institutional and community capacity building under the project has been excellent and the project encourages IDRC to make it a key component in the evaluation of project proposals. An important impact under capacity building worthy of mention is the enrolment of one of the project's community facilitator on the MA programme. Solomon Tetteh from James town has been a key facilitator within the community and has wholly embraced the concept of global environmental change, noted in his community. His research interest will build on the CC Health program and hopefully he may progress to doing its MPHIL. In addition, students trained under the project are expected to either remain at the faculty or join other organisations and contribute their quota to national development.

8.0 APPENDICES

APPENDIX 1: REPORT ON THE TRAINING OF CCHEALTH FACILITATORS ON HOW TO MONITOR AND REPORT ON CLIMATE CHANGE ACTIVITIES IN THE COMMUNITIES

Introduction

As part of the second phase of the CCHEALTH project, a one day training workshop on how to monitor and report on climate change activities in the project communities was organized on February 24, 2011 for all the community facilitators and representatives of Ga Mashie Development Agency (GAMADA). The meeting was held at the conference room of GAMADA and was facilitated by the Monitoring and Evaluation Consultant on the CCHEALTH project. Present at the training were: Mr. Abu Mumuni - RIPS, Mr. Emmanuel Obeng – M&E Consultant, Nii Teiko Tagoe and Ms. Joyce Doe - GAMADA, Mr. Solomon Tetteh and Mr. Bilaal Tackie - James Town facilitators, Mr. Alex Ntiamoah-Boakye and Mr. Adams Vincent – Ussher Town Facilitators, Mr. George Anani Aziaduvor and Ms. Anifatu Issaka – Agbogbloshie Facilitators.

The meeting started at 11:00am with a brief introduction on what has been done on the project so far by Mr. Abu Mumuni. He mentioned to participants at the meeting that the empirical research aspect of the project has been completed and the results have been disseminated in all the project communities in December 2010. A number of health, water and sanitation stressors were mentioned in each of the project communities and these were linked to the changing climatic conditions in the communities. In all the communities, the issue of waste management came up as a big issue and communities linked the disposal of waste into gutters as one of the major causes of flooding in communities in recent times because the heavy rains that are experienced of late need free drains for easy run-off. Also, the poor sanitary environment in the communities has been linked to the frequent outbreak of cholera and the high prevalence of malaria cases in the communities. He indicated that there are a lot of issues that need to be addressed in the communities by the community members and the project team. He mentioned that, the purpose

of the training was to further improve on the skills of the community facilitators to drive the process of change in the communities.

Purpose of Training

The Monitoring and evaluation Consultant informed the participants that the purpose of the training was to equip the facilitators with the skill to be able to report on whatever activity that they may carry out in the communities. He told the facilitators not to wait for the research team at RIPS to prompt them on an activity before anything could be done in the communities. Community facilitators according to him were recommended for the project because they were expected to drive the project in the communities. They are also in a better position to understand community concerns and explain/interact with their people better. Moreover, facilitators live in the community's and so any initiative benefits them as well. He called on the facilitators to see it as a matter of urgency and engage the community members in the issues that came up during the first year activities by identifying ways of addressing the issues and also educating community members on good environmental practices. The project team at RIPS was prepared to support in any community activity that will be organized by the facilitators within the objectives of the project.

The Monitoring and Evaluation Consultant revisited the role of GAMADA in the whole research. He mentioned that GAMADA was supposed to co-ordinate the activities of the community facilitators and also serves as a linkage between the project team at RIPS and other development partners that may visit GAMADA and may want to collaborate with the project team in addressing the health, water and sanitation related issues in the communities.

Details of issues discussed at training

The monitoring and evaluation consultant took participants through a number of project management topics and how to write report. Participants were introduced to key elements of project planning. The facilitator of the workshop first of all, explained to participants, the distinction between a programme, a project and an activity to enable community facilitators know at any point in time what is expected of them.

In the area of project management it was explained that it involves effective utilization of resources to address a felt need. Participants were also taken through the project cycle. It was mentioned that the assessing needs stage which is the 1st stage of the project cycle, planning the project – 2nd stage, implementing and monitoring – 3rd stages have all seen some action in the

CCHEALTH project. It was pointed out that more activities need to be done in the communities as part of the implementation and monitoring stage of the project. Facilitators in the communities were tasked to do more in the area of educating the people on good environmental practices and other climate related issues.

Further it was mentioned that the 4th stage of the project cycle – evaluating the project has also received some attention. He indicated that the advice given to the project team and the facilitators is as a result of the continuous evaluation of the project. The 5th stage of the project cycle – learning from the project and evolving is also on course and that is why new ideas are always welcome because certain things may demand bringing certain people on board to be able to address them in the communities.

Participants were also taking through how to prepare a report. They were also taking through a format of reporting that has been designed for reporting activities on the project. Below are sample of the templates:

Facilitator's Report Format

Name of Facilitator: **Community:**

Date	Activity	Males		Females		Total	Remarks
		<25Yrs	25+ Yrs	<25Yrs	25+ Yrs		
Total							

Quarterly Reporting Format

Cover Page of Report
The cover page on the front of the report should contain the following information**:**

Project Title

Implementing Partner's Name

Contact Information (Address, Phone, Fax & E-Mail)

Reporting Period

Date the report was prepared

Activities, Progress, and Results
Briefly describe the activities undertaken during the quarter as against planned activities and the key achievements. Quantify the results achieved in a tabular form as shown below:

Results Matrix

Activity	**Indicator**	**Output**		**Cumulative Results**
		Target	**Results**	

Report Submission
Submit the report to RIPS within 15 days after the end of the quarter.

Questions and Answers

It was agreed at the training that facilitators as well as GAMADA will report to RIPS at the end of every quarter. Facilitators were tasked to submit their reports to GAMADA in the first week of every quarter. GAMADA was tasked to collate all the reports and submit to RIPS on the 15th day in the first month of every quarter.

Participants wanted to know how they can help avoid duplication of activities in their communities. The facilitator of the training indicated that if the facilitators are on top of issues with regards to climate change, water, health and sanitation related issues in the communities they will be in the best position to help their communities to make informed choices. For instance it will avoid the situation where you have a lot of NGOs implementing almost the same intervention in one community. By being on top of issues, facilitators could advice community members to make effective use of the limited resources available to the community by avoiding duplication of programmes.

Participants were given materials to help them document activities/programmes that may take place in their communities.

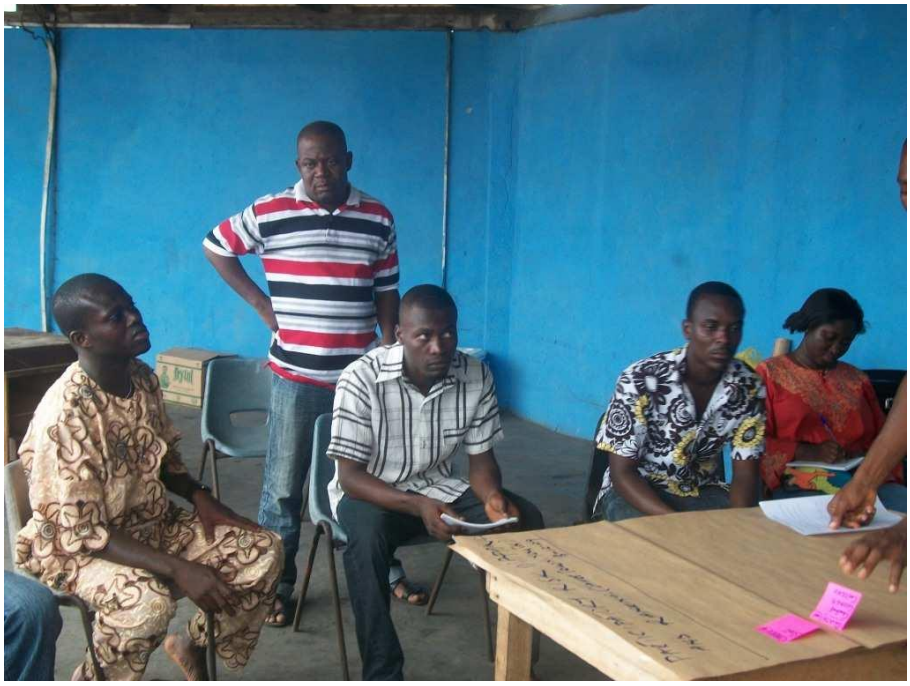
RIPS is to provide facilitators with ID cards and also provide them with information on climate change that will guide them in the way they will organize their climate change activities in schools in the communities.

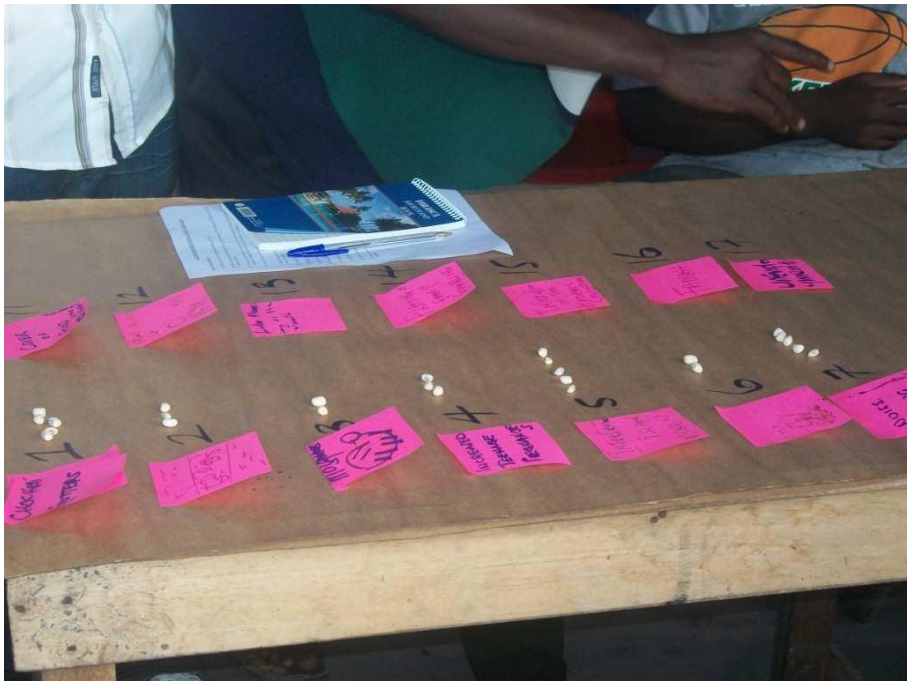
Conclusion

The training was very fruitful. It provided an opportunity to refresh the minds of the community facilitators and GAMADA as to their roles on the project as we begin the second year of the research. The facilitators agreed to hold a meeting at GAMADA on Tuesday 1st March, 2011. The facilitators assured the team of their preparedness to work hard to achieve the objectives of the project. The representative from RIPS assured all the parties that RIPS was prepared to support all of them in their activities in the communities once it is within the project objective.

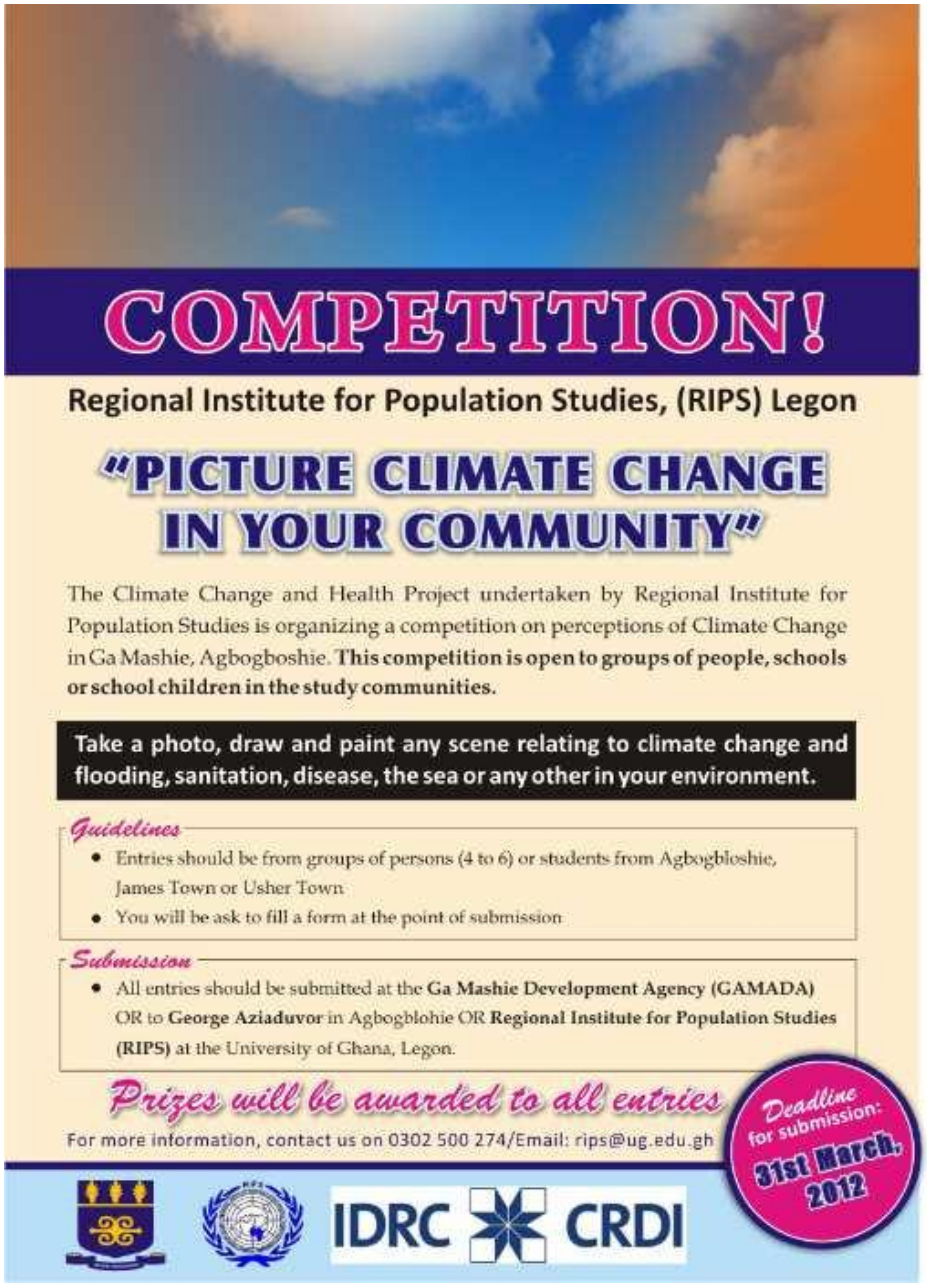
APPENDIX 2: PICTURES OF COMMUNITY MEETINGS

Figure 1: Youth Focus Group Discussions on Risk Mapping - James Town





APPENDIX 3: FLIER FOR PHOTO COMPETITION



APPENDIX 4: (PDF FILE ATTACHED TO REPORT)

A)

Title: Climate Variability and Health Vulnerability in Ga-Mashie, Accra – an implication on small and medium scale enterprises

By: Samuel Nii Ardey Codjoe, Margaret Appiah and Delali B. Dovie

B)

Conference Report Submitted

By: Margaret Appiah (MPhil student, 2011)

Conference Theme: **Local Climate Solutions for Africa 2011**

Venue: **CTICC- Cape Town, South Africa**

Organisers: **ICLEI Africa**

Duration: **27th February-3rd March 2010**

The conference brought together researchers, city authorities from major cities in Africa as well as institutions and organisations working in the area of climate change. I participated in all the plenary and selected parallel sessions.

The opening plenary presentation titled, "towards urban sustainability in Africa" delivered by Konrad Otto-Zimmermann, secretary General of ICLEI, gave an insightful overview of how African cities contribute to the global climate change and the threats it poses for African cities, especially the coastal cities, given the overwhelming challenges of high rate of urbanisation. He also emphasized the need for cities to be the gateway for adaptation and factor climate change in the day to day development planning of our cities.

The mayor of the city of Johannesburg also expressed that climate change though a global issue requires local response. The European Union Ambassador to South Africa indicated their preparedness to partner with Africa in reducing climate change impacts through research and investments in issues related to water and sanitation. The representative from NEPAD raised critical questions as to whether Africa has the framework, the financial resources and the kind of corporation to guide and promote its climate change activities.

Ms. Kayani, co-author of "the State of African Cities 2010 Report" UN Habitat expressed the challenges that informal customary laws governing land acquisition and tenure poses for urban planning and development of cities. It was advised that cities allow gradual formalisation and simple low cost land acquisition.

The parallel session titled "research, science and technology: bridging the gap for Africa's urban future" also contained interesting highlights. The focus of the presentations was on the need to understand spatial and social vulnerability of cities, climate change consciousness in planning, the need for raising awareness and building networks. The session also highlighted the gap in urban specific research. There was also a call to bridge the gap between science and city development. The afternoon session focused on 'health, wellbeing and quality of urban life'. It also emphasized the inequalities that exist in urban settings in spite of the good impression general statistics present. The last set of presentation also provided an interesting case study of viable community initiatives intended to make the community resilient. It was argued that sustainability of interventions will come through community ownership and commitment.

The session on "resilient cities" explored the link between vulnerability and poverty as well as the role of communities in addressing the issues that confront them. A community based adaptation through participatory process in partnership with local stakeholders was advocated for African cities. The session also showcased some of the best practices from some local communities in South Africa.

The mobile workshops also afforded me the opportunity to learn about the poor development practices along the coast of Cape Town that exacerbate the effects of climate change and some of the local innovations being undertaken to address them.

The conference was very informative and an eye-opening one. It provided a platform for learning some of best practices of making African cities resilient to climate change stressors. The issues discussed were practical and relevant to the issues that the Climate Change and Health in Accra project is investigating.

I wish to express my appreciation to IDRC for providing the needed funding to attend this conference. I am also grateful to my Institute, Regional Institute for Population Studies, for giving me this great opportunity.

APPENDIX 5: SAMPLE OF MONITORING & EVALUATION REPORT

Report by the M&E consultant

The M&E consultant (Mr. Emmanuel Obeng) reported on the monitoring and evaluation exercise undertaken in the communities. He mentioned that there was a high level of climate change awareness among community members. However, there is a high dependence of the facilitators on RIPS for activities to be undertaken in the communities which according to him was not good for the sustainability of the project. GAMADA was assigned the responsibility to monitor facilitators to ensure self initiated activities within the communities. He called on steering committee members to advocate for government support, identify and link communities to donors, undertake field visits to know the situation on the ground, and institute best environmental community award to motivate communities to keep their environment clean. So far, the RIPS team has had a discussion with the Sub-Metro representative in the steering committee and he has agreed to support the communities with basic cleaning materials from the sub-metro whenever there are such activities. The representative from GAMADA however, indicated that, there were instances when they provided the communities with such items but they were stolen by people from the communities. The RIPS team together with the Assembly representative and some community leaders are therefore negotiating with the sub-metro to get some of these materials into the community and this should be entrusted with GAMADA. By so doing, the stealing of such items in the community could be minimised and they would always get these materials to do their cleaning. The RIPS team also intend to present these issues when they have the opportunity to present at the Assembly meetings so that the Accra Metropolitan Assembly could help the communities with vehicles to cart refuse whenever, there are such general cleaning activities.

Detailed discussions follow in **Box 1a-1c.**

Box 1a: Illustration of Discussion of the M & E Report to all stakeholders

The non-resident members of the steering committee wanted to visit the communities to acquaint themselves with the project activities that the M&E consultants spoke about and the indicators he used in arriving at that conclusion.

The project team acknowledged the fact that it was necessary to invite steering committee members for field work activities. The challenge however, has been that most of the steering committee members who were contacted were unable to accompany the team to the field due to other commitments.

The M&E consultant in response to the question on how level of awareness of climate change was measured in the communities indicated that the approach used was purely qualitative. He mentioned that people were asked about what they know about climate change and the responses they provided were used in measuring their level of awareness. According to him, responses to the sanitation challenges were much better at the household level than at the community level. He added that awareness was different from practice, and thus there was the need to engage more of the community members to ensure action in areas of indiscriminate disposal of waste, open defecation, and disposal of household waste water.

A representative from the Accra Metropolitan Assembly (AMA) indicated that it has become obvious that the refuse collection challenge in the city cannot be solely handled by AMA. As a result, Accra has been zoned into nine areas and private sanitation companies have been contracted to collect refuse in these zones. He encouraged households to register with the companies for effective refuse collection. The cost of household refuse management according to him was between GH¢20 - GH¢100 per month.

Box 1b: Illustration of Discussion of the M & E Report to all stakeholders

In Agbogbloshie, refuse is usually collected by Zoomlion (a private waste management company) but this is usually at a cost. There are however, no refuse bins in the community. Some community members therefore dump their refuse behind other people's houses usually in the night. This creates sanitation problems for the community since children in the community play around and come into contact with the garbage which has serious health implications.

The Project Leader indicated to the meeting that he has been reliably informed that the waste water from the Accra Brewery Limited (ABL) is creating sanitation challenges in the Agbogbloshie community. Reports further indicated that efforts have been made by the community to get the management of ABL to address the situation but to no avail. He therefore invited the representative from ABL to respond to the concerns from the community.

On his part, the representative from ABL informed the meeting that ABL was in the process of building a treatment plant to address the problem. He indicated that this is a long term plan since the project will take about five years to be completed. The company has discussed the treatment plant project with the Environmental Protection Agency (EPA) and awaiting environmental assessment certification for commencement of the project. He stated that ABL currently disposes its waste through the Accra Metropolitan Assembly (AMA) drainage system.

Box 1c: Illustration of Discussion of the M & E Report to all stakeholders

Representatives from the EPA and AMA made it clear at the meeting that 5-years was too long a time to use to build a treatment plant. They also mentioned that the AMA treatment plant had broken down and so the company could not use that. Messrs Sabah and Oppong-Boadi, both steering committee members agreed to follow-up on the issue with EPA in order to ensure that the company gets a treatment plant as soon as possible. A representative from Agbogbloshie said that the main drain in the community is always choked with waste materials from ABL and the culverts of the drains are broken creating a lot of health problems for them. The representative from Environmental Protection agency has taken the issue up to ensure that an immediate solution is found to the situation.

The ABL representative made it clear to the meeting that the company separates the waste into liquid and solid, and it is only the liquid waste which is disposed through the AMA drainage system. He however, informed the meeting that he will convey the concerns to the management of ABL. At this point, the Project Leader reiterated to the meeting that one of the main objectives of the project is to create a platform where such issues could be

discussed to provide solutions for the communities. He further indicated that RIPS wanted a platform where it could communicate some of the project findings to city authorities and called on the steering committee members who have close relationship with the city authorities to facilitate this process. The representative from GAMADA agreed to liaise with AMA to arrange for the project team to make a presentation to the city authorities at a future meeting of the Assembly.

The meeting came to the conclusion that communities need some form of behavioural change messages to help address flooding, sanitation and health issues. The representative from the Ghana Meteorological Agency stated that the National Disaster Management Organisation (NADMO) has a technical committee that is working on behaviour change but this has not achieved much success. The RIPS team is using community facilitators in working on behaviour change in the project communities and it is hoped that this will yield better outcomes. He also mentioned that the National Development Planning Commission (NDPC) is mandated with the developmental plans and programmes of the country, and it is imperative that the project team links up with them to help integrate climate change issues into development planning.

Also, on the issue of how to get more community members involved in the project, the Project Leader stated that the next phase of the project will involve activities such as drama, radio programmes, focus group discussions with market women, churches etc; education on climate change in schools in the study communities and addressing community issues through a collective approach with members of the communities taking the lead in such initiatives. The basic messages that will be conveyed are how community members perceived their community to be vulnerable to climatic hazards (present and future) and what they think should be done to address the situation.

APPENDIX 6: TABLE GENERATED FROM EXERCISE ON ENVIRONMENTAL STRESSORS WITHIN PROJECT COMMUNITIES

Table: Community stressors and severity scoring by study area and group

Agbogbloshie	**James Town**	**Usher Town**
Adult Males	***Adult Males***	***Adult Males***
1. Lack of gutters (5)	1. Choked gutters (5)	1. Lack of education (5)
2. Choked gutters (5)	2. Floods (3)	2. Choked gutters (4)
3. No access roads (5)	3. Mosquitoes (5)	3. Assessing NHIS drugs (4)
4. Inadequate educational facilities (4)	4. Teenage pregnancy (1)	4. Lack of refuse containers (5)
5. Lack of street lights (5)	5. Inadequate educational facilities (5)	5. Poverty (5)
6. Water leakage from brewery (5)	6. Overcrowding in rooms (5)	6. Lack of a community centre (2)
7. Distinguishing O. Fadama and comm. (5)	7. Noise in the community (5)	7. Shortage of pre-mix fuel (3)
8. Crime and Prostitution (3)	8. Heat (5)	8. Over-crowding (3)
9. Dumping of refuse into gutters (3)	9. Low fish catch (4)	9. Teenage pregnancy (5)
10. Unemployment (4)	10. Sand winning (1)	10. Poor parental care (3)
11. Air pollution (3)	11. Food exposure (2)	11. Low fish catch (5)
12. Floods (5)	12. Street market (5)	12. Non availability of trees (2)
13. Stench from drainage (3)	13. Youth sleep late (3)	13. Inaccessibility of loans (1)
14. Heat (5)	14. Gambling (5)	14. Inadequate sanitation facilities (2)
	15. Heavy rains that disrupts school (2)	15. Heat (5)
	16. Famine (1)	16. Lack of cold stores (4)
	17. Unemployment (5)	17. Floods (2)
Adult Females	**Adult Females**	**Adult Females**
1. Settlement not legitimate (5)	1. Choked gutters (4)	1. Unemployment (5)
2. Distinguishing O. Fadama and comm. (5)	2. Floods (4)	2. Inadequate refuse containers (5)
3.Lack of gutters (5)	3. Lack of refuse containers (5)	3. Bad location of market (2)
4. Floods (4)	4. Improper disposal of waste (1)	4. No traffic lights & zebra crossing (3)
5. Lack of health facilities (5)	5. Scarcity of pre-mix fuel (5)	5. Smoke from burning firewood (4)
6. Water leakage from brewery (4)	6. Unemployment (5)	6. Assessing NHIS drugs (5)
7. Bad street network (4)	7. Lack of capital for work (5)	7. Low fish catch (5)
8. Fear of ejection (1)	8. Lack of traffic lights (4)	8. Heat (3)
9. Poor community planning (5)	9. Mosquitoes (4)	9. Malfunctioning street lights (4)
10. Lack of nursery facilities (5)	10. Poor parental care (3)	10. Stench from refuse (2)
11. Mosquitoes (3)	11. Expensive fishing gears (4)	11. Poor pavement construction (2)
12. Air pollution (smoke) (5)	12. Skin diseases (2)	12. Lack of recreational centres (1)
13. Crime (5)	13. Expensive environmental service (5)	13. Lack of trees (1)
14. Stigmatisation (3)	14. Poor rainfall (5)	14. Blocking of lagoon (2)
15. Heat (3)		
16. Filthy environment (5)		
Youth	**Youth**	**Youth**
1. Distinguishing O. Fadama and comm. (5)	1.Unemployment (5)	1.Lack of refuse containers (5)
2. Floods (5)	2. Poor sanitation (3)	2. Overcrowding in rooms (2)
3. Lack of health facilities (5)	3.Maintenance of sanitation facilities (4)	3. Bad location of market (5)
4. Unemployment (5)	4. Malaria (1)	4. Lack of Library facility (3)
5. Building on waterways (3)	5. No pre-mix fuel (5)	5. Unemployment (5)
6. Crime (5)	6. Lights for fishing (5)	6. Choked gutters (3)
7. Lack of educational institutions (3)	7. Industrial pollution (5)	7. Heat (5)
8. Heat (4)	8. Pair trawling (5)	8. Lack of sanitation facility (3)
9. Street trading (5)	9. Teenage pregnancy (2)	9. Abandoned beaches (2)
10. Lack of drainage system (4)	10. Child labour (5)	10. Air pollution (2)
11. Industrial pollution (5)	11. Over speeding of vehicle (4)	11. Chieftaincy disputes (5)

12. Indiscriminate waste disposal (4)	12. Social events on streets (5)	12. Armed robbery at beach (3)
13. High cost of sanitation services (4)	13. Environmental pollution (4)	13. Inadequate water supply (3)
14. Irregular collection of refuse (3)	14. Heat (5)	14.Lack of information dissemination (3)
15. Lack of sanitation facilities (5)	15. Noise (2)	15. Lack of communication (1)
16. Teenage pregnancy (1)	16. Floods (5)	16. Noise (2)
17. Stigmatisation of community (3)	17. Sea level rise (5)	

Source: Focus group interviews, 2009

APPENDIX 7: CONFERENCE REPORT ON INDIGENOUS KNOWLEDGE (PDF PRESENTATION ATTACHED WITH ANNEXES)

Title: Building resilience to climate change through adaptation: the role of indigenous knowledge COP 17 side event round table discussion & exhibition on African young scientist/youth initiative on climate change & IKS, 29-30 November

By: Margaret Appiah

ANNEX A: MPHIL STUDENT FINAL THESIS (ELECTRONIC COPY ATTACHED)

Title: Climate Variability and Health Vulnerability in Ga-Mashie, Accra

By: Margaret Appiah

This thesis is submitted to the University of Ghana, Legon in partial fulfilment of the requirement for the award of Mphil Population Studies Degree, July 2011

ANNEX B: PICTURES OF COMMUNITY PLAYS & DRAMA (DVD SENT VIA SURFACE MAIL)

Figure 2: Akamadzen Mantse

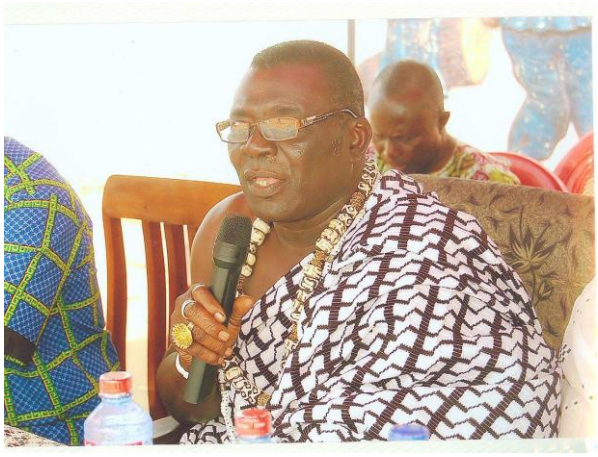


Figure 3: Facilitators at occasion

Figure 4: Presentation of Plaque to Overall winning school