THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Determinants of Community Climate Change Awareness in Homa Bay County, Kenya

Ongeko, K. O.
Ph.D. Student, Masinde Muliro University of Science and Technology,
Disaster Management and Sustainable Development Department, Kenya
Part Time Lecturer, Department of Psychology, Kenyatta University, Kenya
Dr. Mugalavai E. M.
Lecturer, Centre for Disaster Management and Humanitarian Assistance (CDMHA),
Disaster Management and Sustainable Development Department,
Masinde Muliro University of Science & Technology, Kenya
John A. F. Obiri
Professor and HOD, Department of Disaster Management and Sustainable Development,
Masinde Muliro University of Science and Technology, Kenya

Abstract:
Climate change has emerged as a complex challenge in the Lake Victoria Basin. This is due to the basin's geographical and climatic conditions, its high dependence on natural resources, limited capacity to adapt to a rapidly changing climate and frequent natural disasters. This study aimed at examining climate change awareness levels among households in Homa Bay County with a view to guide policy makers   in decision making and management of climate change impacts. A quantitative household based cross-sectional survey questionnaire was used to collect information from three hundred and eighty-four (384) people drawn from the eight sub-counties of Homa Bay County namely Ndhiwa, Homa Bay, Rangwe, Suba, Mbita, Karachuonyo, Kasipul and Kabondo Kasipul. Target respondents comprised of men and women aged fifteen to seventy-five years old. This study employed multi-stage sampling technique to select each Primary Sampling Unit (PSU). Qualitative data was collected through in-depth interviews conducted to fifteen representatives from government and five from non-state actors and four Focused Group Discussions. Primary data was obtained from key informants through interview- schedules and questionnaires while secondary data sources included published research papers and relevant reports. Quantitative data analysis was done using Statistical Package for Social Sciences (SPSS). For qualitative data, coding was conducted and most prominent themes across the transcripts were identified. The study found out that nearly all respondents (98.7%) indicated that they had experienced at least one extreme weather event a year prior to the interview with over half of the respondents having experienced drought (78%), heavy rains (74%), pests (71%) and high temperatures (51%) while (28%) had experienced flooding. Strong relationships existed between the different levels of education, gender, occupations, age and place of residence. The study recommended national and county level institutions to gather, organize, package and disseminate prompt and targeted audience specific climate change information that is interfaced appropriately with community information structures. This can be done by creation of forums for discussion and innovation of adaptation strategies through radio call-in programs for rural populations in both national and vernacular stations that bring together those with relevant expertise to share their experiences and develop solutions to commonly expressed climate change concerns.

Keywords: Demographic factors, Drought, seasonal shifts, weather information, Homa Bay

1. Introduction
There is a worldwide consensus that global warming is a real, rapidly advancing and widespread threat facing humanity in the 21st century (IPCC, 2007a). Climate change refers to changes over time in the average and variability of surface temperature, precipitation, wind as well as associated changes in earth's atmosphere, oceans and natural water supplies, snow and ice, land surface, ecosystems, and living organisms (IPCC, 2007a). The uniqueness of the current global climate change, relative to historical changes, is attributed to the role of human activities and the current and projected dramatic changes in climate across the globe (APA, 2012). The IPCC projects an acceleration and deepening of the impacts of climate change globally with potentially serious implications for the cultures, subsistence economies, health and futures of indigenous communities (IPCC, 2007b).

Climate change is therefore one of the most urgent environmental issues facing our planet and its inhabitants. Even though climate change and variability are not new in Africa's history, the incidence and severity of extreme weather events, both floods and droughts, has increased dramatically in recent years. Sub-Saharan Africa possibly is more vulnerable to climate change effects because of its limited capacity to adapt (Bryan *et al.*, 2011) and the region's natural vulnerability will thus be increased with climate change impacts (World Bank, 2010). Climate change is therefore one of the greatest challenges of our time and its adverse impacts undermine the ability of all countries to achieve sustainable development. Studies have predicted that if the same trends continue we will have about 200 million food-insecure people and an additional 24 million malnourished children by 2050 with the worst impacts being felt by the poorest people majority of who are marginalized and live in developing countries (IPCC 2014).

Kenya in the recent past has seen increased evidence of climate change such as rising temperatures and changing rain patterns, and has experienced extensive climate related impacts through the increased frequency and intensity of extreme weather events such as droughts and flooding (GoK, 2014). Research has established that Climate Change has emerged as a major complex challenge in the Lake Victoria Basin region of Kenya, given the basin's geographical and climatic conditions including the high dependence on natural resources and limited capacity to adapt to a rapidly changing climate and frequent natural disasters. The region is experiencing the impact of climate change through food shortage, water supply, increasing incidences of vector borne diseases, power outages which could dampen economic prospects (World Bank, 2010). This scenario will also hinder the achievement of the Sustainable Development Goal (SDG) specifically goal no. 13, focusing on enhancing the resilience of climate change (IPCC 2014).

Homa Bay County is equally vulnerable to the climatic variability and climate change which are likely to increase the frequency and magnitude of some natural disasters and extreme weather events notably, drought, floods and high food prices which continue to affect the region's most vulnerable groups (GoK, 2010). According to the Homa Bay County Integrated Development Plan (GoK, 2013), climate change has become too obvious in the County, with the ever-declining stock of fish in Lake Victoria, drying up of water ways and worsening weather conditions, the local populations have not been able to sustain food production at a level commensurate with growth in the population. According to the Homa Bay County Integrated Development Plan (CIDP) 2013-2017, these extreme events could be worsened by existing social and economic challenges in the County especially the burden of disease because the County has one of the worst health indicators countrywide. It is noted that without appropriate planning and intervention measures in place, many residents will lose their livelihoods especially in fishing, agriculture, tourism and forestry where it is the major source of employment (GoK, 2013).

In 2006, the Pew Global Attitudes Survey found that large majorities of respondents from developed countries had heard of global warming, while awareness remained quite low in several developing countries. In particular, large majorities of respondents had never heard of global warming in Pakistan, Indonesia, Nigeria, and Egypt (Pew Project, 2006). A study in Nigeria indicated that the level of awareness of local communities on climate change impacts was still low in the Niger Delta region of Nigeria (Adeniyi, 2011) and about 60% of the respondents knew little or nothing about climate change and its impacts. Climate change awareness in Kenya has also been indicated to be low countrywide (GoK, 2010). This is the case for many developing countries whose economy is highly dependent on natural resource base that makes them highly vulnerable to climate variability and change. Therefore, the climate awareness and understanding of individual households and communities in certain areas does not only provide better location specific insights but also helps generate additional information relevant to policy and interventions to address the challenge of sustainable development in light of variable and uncertain environments (Legesse *et al.*, 2013; Yusuf *et al.*, 2008). According to Kabir *et al.* (2016) knowledge of climate change is necessary in empowering people to adapt appropriately and for communities and households to adjust to the ongoing and future climate change.

Despite numerous efforts towards raising awareness levels several studies have still reported low levels of awareness on climate change and its markers generally in Africa and specifically considerably low among Kenyans. According to the National Climate Change Response Strategy, the level of awareness of climate change issues and impact is low countrywide. Through the focus group discussions undertaken during the stakeholders' forum conducted during the development of the Strategy, key informant interviews, county consultations and desk reviews confirmed the deficiency of clear, simple and relevant climate change information as one of the major hurdles affecting the country's response to the phenomenon. Other challenges identified through key informant interviews and county consultation forums included unavailability of information in some locations within the counties; unreliability of available information; high illiteracy levels within communities, hence limiting access; low involvement by the mass media; and the absence of a central location or platform for climate change information. This fact was also confirmed by a study conducted by the British Broadcasting Corporation (BBC) in 2009 which indicated that most Kenyans feel they lack basic information to enable them cope with climate change (BBC, 2009).

The uncertainty surrounding the actual depth of the lack of awareness necessitates an urgent need to establish the extent of this lack of awareness (GoK, 2005). However, a major consensus is that climate change risk is not well understood by the public (Petheram *et al.*, 2010; Read *et al.*, 2010). Therefore, raising the need to conduct research to explore awareness and knowledge variations on climate change in different sectors of the global community is important. This is because in life one can only combat a known enemy. To address this gap in knowledge, this study therefore sought to establish levels of community climate change awareness among residents of Homa Bay County using a number of common climate change markers namely temperature, rainfall, floods, drought and Wild Fires**.**

2. Materials and Methods

2.1. Study Area

This study was carried out in the County of Homa Bay. The County lies between latitude $0^o15'$ South and $0^o 52'$ South, and between longitudes 34° East and 35° East (Figure 1). The County covers an area of 4,267.1 Km^2 inclusive of the water surface. The county is located in South Western Kenya along Lake Victoria where it boarders Kisumu and Siaya Counties to the North, Kisii and Nyamira Counties to the East, Migori County to the South and Lake Victoria and the Republic of Uganda to the West (CIDP, 2013 - 2017). The study was carried out in all the eight sub-counties Homa Bay County namely; Ndhiwa, Homa Bay Town, Mbita, Suba, Karachuonyo, Rangwe, Kasipul and Kabondo Kasipul; 19 divisions, 116 locations and 226 sub locations. Based on projections from the 2009 Kenya Population and Housing Census, Homa Bay County had an estimated population of 1,038,858 persons consisting of 498,472 males and 540,386 females by the end of the year 2012. The county Poverty rate for 2009 stood at 49.6% (Wiesmann *et al.*, 2014). The main economic activities include fishing and fish trade, fish processing, agricultural products: maize, millet, cassava, sunflower and sand harvesting (KNBS, 2013).
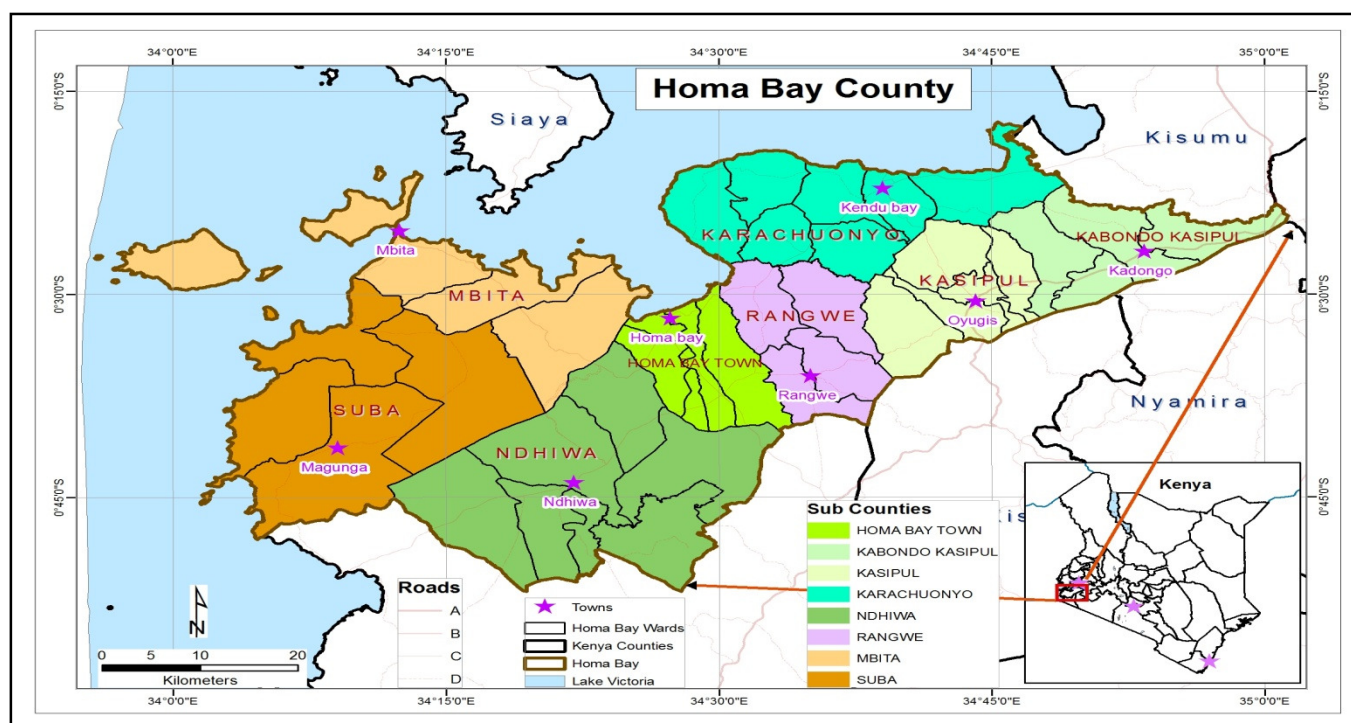

Figure 1: Map of Homa Bay County
Source: Homa Bay CIDP, 2013 - 2017

The main contributor to environmental degradation in the County has been deforestation with the resultant reduction in vegetation cover leaving land bare and vulnerable to soil erosion, low rainfall and flash floods. This loss of vegetation has been largely attributed to human activities such as bush clearing for farming and settlement activities, firewood and charcoal production, poor disposal of solid waste materials such as plastics, nylon papers, packaging tins, food remains and faecal matter (GoK, 2013).

The county is divided into two main relief regions namely the lakeshore lowlands and the upland plateau. The lakeshore lowlands lie between 1,163 – 1,219 m above sea level and comprise a narrow stretch bordering Lake Victoria especially in the northern parts of the County. The upland plateau starts at 1,219 m above sea level and has an undulating surface which has resulted from erosion of an ancient plain. It is characterized by residual highlands such as Gwassi and Ngorome hills in Suba, Gembe and Ruri Hills in Mbita, Wire Hills in Kasipul as well as Homa hills in Karachuonyo. Kodera forest in Kasipul and the Kanyamwa escarpment that runs along the borders of Ndhiwa and Mbita also form part of the upland plateau. To the west of the County lies the Lambwe Valley where Ruma National park is located (GoK, 2013). The county is dissected by a number of rivers namely Awach Kibuon, Awach Tende, Maugo, Kuja, Rangwe and Riana rivers, most of which originate from Kisii and Nyamira Counties. There are also several seasonal rivers and streams which originate from highlands within the County. The County boasts of 80% of the Kenyan Lake Victoria which therefore is the main source of water but the Lake has suffered serious pollution as a result of environmental degradation (GoK, 2013).

2.2. Research Design and Sampling Strategy
This study adopted a cross- sectional survey and evaluation research designs. The information required for this study was both qualitative and quantitative and was gathered from male and female farmers in Homa Bay County. The questionnaire was first piloted on a small sample of the population in an area with similar characteristics but not within the study area, in order to establish the reliability of the instrument. Questionnaires were used to gather information about knowledge, farmers public risk perceptions and responses to impacts of climate change in the study area. The respondents were requested and assisted to fill the questionnaire. Demographic characteristics, including gender, age, highest education qualification and income were studied. A face to face interview

schedule on the subject of knowledge, public risk perceptions and responses to impacts of climate change were conducted with some of the participants sampled for the study. The interviews were semi-structured, allowing participants to freely express their experiences and attitudes in their own language. Focus group discussions were held in four different areas within the county. The main areas tackled included understanding, perception of causes and consequences, sources of information, adaptation strategies and barriers to taking action on climate change effects.

A sample size of 384 Respondents was used in the study. These farmers were selected randomly. Quantitative data analyses were done to establish the means, modes, standard deviations, variance, percentages, and frequencies while inferential analyses were by use of chi-square test and Spearman rank order correlation analysis. Chi-square tests were employed to test levels of association between non-parametric nominal variables. The analysis of the sample was done according to the total sample, major geographic regions, gender, age brackets, level of education, poverty index and occupation categories. For qualitative data, a coding frame was developed through a consultative process with the research assistants based on the research questions, and was further extended through open coding of a selection of the transects. Once the coding process was completed for all transcripts, the researcher identified which themes were most prominent across the transects and selected and grouped together all the quotations relating to each research question, so that they could be compared and analyzed together.

3. Results and Discussions

3.1. Socio-Demographic Characteristics of the Respondents

The results of gender distribution among households in Homa Bay County showed that 246 (64%) were male while the rest 138 (36%) were female (Table 1). In the traditional set up among the Luo community men are supposed to head the family unless in cases of death and this result concurs with another conducted by Mwakubo et al. (2004) who recorded that many households in sub-Saharan Africa were headed by males and this explains the high number of male respondents in the study. Gender is an important factor in climate change debates and particularly in awareness in that men and women have different gender roles, responsibilities and decision-making power, leading to disadvantages especially for women.

In terms of age thirty five percent (38.3%) of the household heads were within the age bracket of 15-35years, 38% (36-50 years), and 15.4% (51-65years) while 8.3% fell within the bracket of 65years and above. While climate change will have county-wide impacts, it will be greater for the most vulnerable including older people, children, women and those with chronic conditions. Most of the young people below 35 had high levels of awareness attributed to their access to multiple sources of information. With regards to education level of household heads the results showed that 22.4% had attained primary level of education, 36.7% secondary, and 33.8% tertiary while 7% had no formal schooling. The fewer numbers of those without formal education could be attributed to the increased access to education due to free primary education and the capitation given to secondary school students. Level of education is a major factor in determining awareness of changes in climate change. The findings revealed that 84% household heads were rural based while 16% were urban dwellers. Rural communities are highly dependent upon natural resources that are affected by climate change and are therefore more likely to be aware of changes in climate. The respondents were asked to state their levels of income and the findings revealed that 33.1% of the household heads were poor while 66.7% were between medium to high income. The level of income of a community whether expressed in terms of economic assets, wealth or poverty index, has a bearing on their awareness levels. In terms of employment, majority 73.4% of the household heads were not formally employed while 26.6% were engaged in gainful formal employment. Self employed persons are mostly engaged in some subsistence farming and therefore more likely to be aware of changes in climate than those involved in other gainful employment.

3.2. Level of Climate Change Awareness

To ascertain the awareness levels the respondents were asked if they had heard the term climate change in which majority of the respondents 375 (97.7%) indicated that they had heard the term climate change implying very high awareness levels. Nearly all respondents (98.7%) indicated that they have experienced at least one extreme weather event while only a paltry 2.3% responded on the contrary in their area in the year prior to the interview. The results are in tandem with a study conducted in Upper Nyakach in Kisumu County that revealed that 90.9 % of the respondents reported having observed changes in the overall climate in their region while 9.1 % reported not having noticed any changes in climate in the region (Ajwang, 2016). Further analysis showed that over half of the respondents had experienced drought (78%), heavy rains (74%), pests (71%) and high temperatures (51%). About three out of ten (28%) had experienced flooding with (21%), (10%), (10%), (7%) and (5%) experiencing cold weather, thunder, storms, wild fires and landslides respectively.

It is clear from these figures that a large majority of the respondents said that their households have already been affected by climate change. Consistent results were found. Also consistent with the current findings is a study on vulnerability assessment to climate change of the LVB inhabitants by the LVBC (2011) reported that most people in the Lake Victoria Basin had experienced climate change markers related to adverse changes in weather, while a study by Ndambiri *et al*. (2012) reported that 94 % of farmers in Kyuso District, Kenya, were aware of climate change and its effects. Similar results have also been documented across the African continent for example the results of a study in Lagos Nigeria by Adeniyi (2011). found out quite high awareness levels among respondents with all having at least heard of climate change before while about half (52%) said they were somewhat informed' about climate change with 24% saying they were very well informed the results also concur with the findings of a similar study in which 100%, 99% and 97% of the respondents in Great Britain, Japan and France respectively had heard of climate change (Pew, 2006). These findings are on the other hand are contrary to a study conducted by the Pew Global Attitudes Survey that found out that only 12%, 35% and 42%

of the surveyed public in Pakistan, Indonesia and Nigeria respectively had heard about climate change. It should hover be noted that the findings from this study and others noted above do not tally with those by GoK (2010) which concluded that Kenyans have generally low climate change awareness levels.

Even with these high levels, variation in awareness and knowledge of climate change were still abound amongst different sections of the public as shown in Table 1 based on the levels of significance.

Variable	Knowledge of climate change				Statistics
	No (%)	Yes (%)	Don't Know (%)	Total (%)	
Sub-County	69 (18)	311 (81)	4 (1)	384 (100)	χ^2 = 74.193, df =21; p= 0.000
Age	69 (18)	311 (81)	4 (1)	384 (100)	χ^2 = 43.025, df =22; p= 0.005
Education	69 (18)	311 (81)	4 (1)	384 (100)	χ^2 = 53.060, df =8; p= 0.000
Income	69 (18)	311 (81)	4 (1)	384 (100)	χ^2 = 44.332, df =8; p= 0.000

Table 1: Levels of awareness in relations to demographic variables

For example, Pearson Chi-Square value showed that there was a highly significant (P<0.000) association between awareness of climate change and the Sub-County of respondent. Over nine out of ten respondents from Mbita and Homa Bay Sub-Counties were aware of climate change compared to less than seven out of 10 for Suba and Karachuonyo Sub-Counties as in Table 1. There was also strong association between the level of awareness and the age of the respondents shown by a Pearson Chi-Square value of (P<0.005). About nine out of ten of the respondents aged between 15 and 35 were aware of climate change with 100% of those aged between ages 15 and 19 being aware of climate change. This high awareness is attributed to the awareness creation for youth in learning institutions who have various ways of accessing information. The levels of awareness decrease as one tends towards the higher ages with only about 50% of those aged 65 and above being aware of climate change. This trend can be as a result of the limited sources of information available to this age group.

The level of awareness was also found to be significantly related to the levels of education and income of the respondent at p values of (P<0.000) and (P<0.000) respectively as shown in Table 2. From Table 1 it can be deduced that the higher the level of education and income of the respondent, the higher the level of awareness. This could be due to the fact those with higher levels of education also have high levels of interaction and therefore are in a better position to have heard of climate change. Higher levels of education also have relationship with higher levels of income and therefore can afford the various channels of communication from where they get information on climate change. To communicate effectively about climate change, it is essential to know how people understand it and to explore the ways in which they are receiving information on the subject.

Similarly, variations were noticed in other areas for example a research conducted in England revealed that a higher proportion of men (86%) than women (69%) have heard of 'climate change (DEFRA, 2002; Bord *et al*., 2000; Bibbings, 2004a). Graduates (91%) were more likely than those without qualifications (68%) to have heard of climate change (DEFRA, 2002). In another study done in Lagos, fewer 18-25 year olds (63%) had heard of 'climate change' compared to 45-64-year-olds (78%) (Adeniyi, 2011). Similarly, awareness of the causes and impacts of climate change is generally lowest amongst the under-25 and over-65 age groups (DEFRA, 2002; Bibbings, 2004a; Hargreaves et al., 2003). The study therefore concludes that climate change awareness levels was in a way related to the Sub-County, age, education level and income levels of the respondents.

3.2.1. Observed Changes in Temperature

The study established that majority 75% said that temperatures have increased with (51%) of the household heads reporting having experienced very high temperatures while 49% indicated experiencing no major increases in temperatures one year prior to the time of the study. A bigger percentage (75%) of the respondents indicated that temperatures have generally increased with only 15% saying the contrary. This view corresponds with the fact that Climate has already been observed to change slightly in the County by experiencing a moderate (1ºC) increase in mean temperature (GoK, 2016) and with This is consistent with the IPCC climate projections indicating that East Africa will experience warmer temperatures (IPCC 2007) and that that average temperatures are rising (Downing et al, 2008). According to the Kenya Meteorological Department, GoK, 2013 Average annual temperatures in Kenya have already increased by 1.0°C over the last 50 years and prolonged droughts have been experienced every year since the millennium.

Significant differences were observed across the sub counties of the respondents concerning being aware of changes in temperature (χ^2 = 44.705, df = 7, P < 0.000) with more 90% and 68% from Rangwe and Mbita respectively having noticed major changes in temperatures than their counterparts from Kasipul (36%) and Kabondo Kasipul (35%) sub counties. Similar significant differences in awareness of temperature change were observed across the different occupations (χ^2 = 40.892, df = 16, P < 0.001) with majority of the housewives (82%) and farmers (50%) having noticed the changes than did business persons (36%) and forest workers (17%). Significant differences in awareness of changes in temperature were also exhibited across the various levels of education (χ^2 = 34.855, df = 12, P < 0.000)   , age groups (χ^2 = 65.614, df = 33, P < 0.001)   and income levels (χ^2 = 46.905, df = 12, P < 0.000)   with respondents with no formal education and those with diploma and university levels, those above 25 years and lower income groups having been more likely to have noticed changes in temperature than their counterparts with primary and secondary education, those below 25 years and those with higher incomes respectively.

The results therefore indicate that the level of awareness on changes having been noticed on climate in the study area had some linkage with the sub county, occupation, levels of education, age and income level of the respondent. The results are consistent with

those of Ajuang, 2016 who also found out that there existed linkages between level of education and awareness of changes in temperature but differed in terms of linkages to age and gender.

3.2.2. Observed Changes in Rainfall Patterns

Concerning observed changes in rainfall patterns, majority of the respondents (74%) had experienced heavy rains while only 26% indicated having not experienced changes in rainfall amounts overtime. Majority of the respondents indicated there is a general change in weather and the environment in that seasons start and end at different times than they used to be 84% and therefore less predictable (88%), that rains have become less predictable 84%, while another 78%, 78%, 75%, 68% and 53% said that seasons are less predictable as they either come earlier or later than expected and rains having increased in quantity. Similar results were noted by Ajwang, (2016) where he found out that the household heads had noticed changes in frequency and intensity of rainfall. Adeniyi, 2011 also found out that 97 percent of the respondents observed an unpredictable rainfall patterns over the past 10 years, and 3 percent noticed predictable and constant rainfall patterns. Almost 72 percent of the respondents said that the incidents of drought had been increasing and linked it to the untimely and unusual rainfall patterns and perceived temperature increase over the past few years (Bhusal, 2009).

Rains having become more ($\chi^2 = 18.798$, df = 3, $P < 0.000$) was significant with gender of household head in that there existed likelihood that more female (23%) had experienced more rains with only 11% of male counterparts having experienced more rains. This could be attributed to different levels of involvement with farming activities where most of the agricultural work left for women in the rural areas. Level of education was significant with rains becoming less intense ($\chi^2 = 44.736$, df = 12, $P < 0.000$), rains being less predictable ($\chi^2 = 32.648$, df = 12, $P < 0.001$) and seasons starting and ending at different times than they used to be ($\chi^2 = 30.541$, df = 12, $P < 0.002$). Those with lower levels of education were more likely to have experienced less intense rains in that 70% of those with no education, 58% with primary education, 50% with secondary, 425 with Diploma and 31% with University levels education had experienced less intense rainfall. Significant differences were also observed across the different occupations with seasons being less predictable ($\chi^2 = 175.225$, df = 48, $P < 0.000$) and rains having been more intense ($\chi^2 = 152.122$, df = 48, $P < 0.000$).

More farmers were most likely to have noticed the differences in onset of seasons and the intensity of rainfall due to their dependence on rain-fed agriculture as compared to students and teachers and therefore having the ability to notice the effects of the changes on their livelihoods. It is clear from these figures that a large majority of the respondents said that their households have already been affected by climate change. Climate change poses a big threat to the livelihoods of the rural inhabitants of Homa Bay County who solely depend on rain fed agriculture and the only way out is for farmers to adopt strategies that will enhance their resilience to the impact of climate change. The experiences clearly show that climate change is inevitable and will automatically exacerbate existing water stress levels. Similar relationships touching of education level and the various livelihoods were also deduced by Ajuang, (2016) in his study conducted in Kisumu County.

Proportionally more female than male said that rains had become less (78.3%) and unpredictable (84.8%). They also said that seasons started and ended at different times compared to the past (86.2%) making the seasons more unpredictable (79%). Rural residents registered proportionately higher scores compared to their urban counterparts on all the indicators save for rains having become less 82% against 77.4%. Karachuonyo residents had a unanimous agreement 100% on seasons starting and ending either earlier or later than they used to be with flooding being more intense, seasons and rains being less predictable. Higher proportions of older respondents than the younger ones reported that rains have become unpredictable 99% and droughts become more frequent 87% and that, seasons start and end at different times compared to the past 97% and therefore being less predictable 94%. Inversely, the younger persons scored higher proportionally on rains having become less 86%.

3.2.3. Observed Changes in Drought Patterns

The study found out that nearly all households (98.7%) indicated that they had experienced at least one extreme weather event a year prior to the interview with over half of the respondents (78%) having experienced drought only 22% indicating that they had not experienced the same over the same period. This indicates that the level of awareness of climate change among residents of Homa Bay County is relatively high. Climate change poses a real threat to development prospects and livelihoods, and can undermine investments made to meet Vision 2030 goals (GoK, 2013). It continues to note that average temperatures are rising, rainfall patterns are changing and the incidence and intensity of extreme weather events such as droughts and floods is increasing. Almost similar results came out of a study by Ajuang (2016) in which 75 % of the respondents reported that droughts had become more frequent contrary to the 22 % who believed the contrary. When asked to comment on the severity of drought, 68.5 % of the respondents said that they had observed that drought events are increasingly getting severe as opposed to 29.1 % who observed a decrease in severity of drought events.

Adeniyi, 2011 also found out that 97 percent of the respondents observed an unpredictable rainfall patterns over the past 10 years, and 3 percent noticed predictable and constant rainfall patterns. Almost 72 percent of the respondents said that the incidents of drought had been increasing and linked it to the untimely and unusual rainfall patterns and perceived temperature increase over the past few years (Bhusal, 2009). Droughts and floods have devastating consequences on the economy, environment and society, causing food insecurity, malnutrition, damage to infrastructure and loss of life. There is scientific evidence that the frequency of droughts, floods, and other extreme climate events has increased in recent years. The recent (2010-2011) Horn of Africa drought crisis demonstrated how vulnerable Kenya is to climate change but also presented an opportunity for the country to develop appropriate response strategies and activities required to making communities safer and resilient (GoK, 2010). The combination of increased temperatures and decreased precipitation make for an increase in drought risk. The study also revealed that such demographic factors as level of

education of climate, gender, employment status of the household head had significant influence on the levels of awareness on climate change.

Observation of changes in drought was much more significant with sub-county of respondent (χ^2 = 47.503, df =7, P = 0.000) with 92% of Karachuonyo households having experienced drought as compared with only 55% from Ndhiwa sub-county. Kasipul respondents had higher proportions of temperatures having increased and droughts becoming more intense both at 91% while Rangwe counterparts indicated that rains have become less (93%). Drought was also strongly influenced by the main livelihood of the household (χ^2 = 35.003, df = 16, P = 0.004) in that more farmers 85% were more likely to have experienced drought than was doctors 5%. Significant differences also existed between the level of education and the experience of drought by households for example those with none formal education (96%) were more likely to have indicated experiencing drought than those with diploma (71%) and University education. The results concur with a study by Ajuang, (2016) who found significant relationship between drought and gender but contradict each other in-terms of relationship with level of education. Proportionally more female than male said that drought had also become more frequent (68%) with insignificant difference in the proportion of men and women who indicated that there has been an increase in temperature. Higher proportions of older respondents than the younger ones reported that droughts become more frequent 87% and that, seasons start and end at different times compared to the past 97% and therefore being less predictable 94%.

3.2.4. Observed Changes in Flood Occurrence
To ascertain occurrences of floods the respondents were asked if they had experienced floods and about three out of ten (28%) had experienced flooding. These results were concurrent with the findings of a similar study conducted by Ajuang (2016) who found out that 37.6 % of the households reported having observed flood occurrence in Upper Nyakach Division while 62.4 % had not observed occurrence of floods in the study area. About 17% indicated that flooding had become more intense while another 14% said that flooding had become more frequent. Proportionally, floods were experienced by most people in Rangwe (86.2%), Karachuonyo (56.6%) and Suba (43.4%). The results however differed from a similar one conducted in Tana River County that revealed that all (100%) the respondents indicated to know about floods while only 77.4% of the household heads indicated that they had directly been affected by floods. Further analysis indicated that only about 14% indicated that they had no significant flood experience (Mulwa, 2013).

Significant differences were observed between the different occupations (χ^2 = 40.491, df = 16, P > 0.001) and age categories (χ^2 = 27.351, df = 11, P > 0.003). To these levels farmers (38%) were more likely to have experienced flooding compared to teachers (27%). The Sub county of respondent had a strong relationship (χ^2 = 138.224, df = 21, P > 0.000) with flooding being more intense in that households in Karachuonyo Sub county were more (43%) likely to have experienced intense flooding than their counterparts in Homa Bay (6%). The same applied to education level (χ^2 = 71.027, df = 12, P > 0.000) in that those with no education (57%) being much more likely to have experienced intense flooding than those with diploma (6%). This could be as a result of lower education level also being related to agricultural based livelihoods that are prone to vagaries of weather.

There existed no significant relationship between flooding occurrence and levels, employment status, gender and age of the respondent. The effects of the floods were felt more by female 48 (34.8%) than males 60 (24.4%); more by the rural 92 (28.5%) than urban residents; those with low levels of education 44 (81.6%) than those with higher education; low income earners 45(72.6%) than high income earners 63(25.4%) and the unemployed 83(29.4%) than the employed 25(24.5%). Those in the higher age brackets and those whose duties have a bearing on weather including farmers, business persons and government officers indicated having experienced extreme event. Floods specifically have the potential of equally devastating consequences in recent years, including loss of lives and livelihoods, personal property damage and damage to infrastructure, with ramifications for the economy.

4. Conclusions and Recommendations

4.1. Conclusions
The study found out that nearly all households (98.7%) indicated that they had experienced at least one extreme weather event a year prior to the interview with over half of the respondents (78%) having experienced drought. This indicates that the level of awareness of climate change among residents of Homa Bay County is relatively high. The study also revealed that such demographic factor s as level of education, gender, employment status of the household head had significant influence on the levels of awareness on climate change. Despite being aware of climate change and its effects access to information on weather and climate is not sufficient and timely. Advance knowledge about a potential disaster as well as timely and permanent access to this information can motivate communities to establish safeguards particularly at the household level. To this end households can save excess food produce for a forecast drought and selling livestock before a disaster strikes. Therefore, there is need for segmented and audience specific climate change information while utilizing specific preferred channels and media

4.2. Recommendations
1. The research recommended establishment of an early warning system and a team in each ward and village to increase community access to national and local weather information and to support people to prepare for disasters such as droughts and floods.
2. The study recommended national and county level institutions to gather, organize, package and disseminate prompt and targeted audience specific climate change information that is interfaced appropriately with community information structures. This can be done by creation of forums for discussion and innovation of adaptation strategies through radio call-in programs for rural

populations in both national and vernacular stations that bring together those with relevant expertise to share their experiences and develop solutions to commonly expressed climate change concerns.

5. References

  i. Adeniyi, A. (2011). Climate change knowledge, perception and concern among corporate elites in Lagos. Vantage Publishers. Lagos, Nigeria.
 ii. Ajuang, C.O., Abuom, P.O.,Bosire, E.K., Dida, G.O.and Anyona, D.N.(2016). Determinants of climate change awareness level in upper Nyakach Division, Kisumu County, Kenya. Springerplus. 2016; 5(1): 1015.
iii. APA, (2012). Psychology and global climate change: Addressing a multi-faceted phenomenon   and set of challenges. Retrieved from http://www.apa.org/science/about/   publications/climate-change.aspx. Date retrieved-7/10/2014
 iv. BBC (2004). Poll for Climate Change Special. www.bbc.co.uk: BBC. Date retrieved-7/10/2014
  v. Bhusal, Y.R., (2009). Local Peoples' Perceptions on Climate Change, Its Impacts and Adaptation Measures in Mid-Mountain Region of Nepal (A Case study from Kaski District).BSc (Hons) Dissertation, Tribhubhan University, Nepal (unp.)
 vi. Bibbings, J. (2004a). Climate Concern: Attitudes to climate change and wind farms in Wales. Cardiff: Welsh Consumer Council and Friends of the Earth Cymru.
vii. Bord, R.J., O'Connor, R.E. and Fisher, A. (2000). In what sense does the public need to   understand global climate change? Public Understanding Science 9 (3):205–218.
viii. Bryan, E., Ringler, C., Okoba, B., Roncoli, C., Silvestri, S. and Herrero, M. (2011). Coping with Climate Variability and Adapting to Climate Change in Kenya: Household and Community Strategies and Determinants.   International Food Policy Research Institute (IFPRI). Washington, DC. (Accessed online on 7/4/2015- www.ifpri.org).
 ix. DEFRA (Department for Environment Food and Rural Affairs) (2002). The Environment in your Pocket. London: HMSO.
  x. GoK (2013). Homa Bay County Integrated Development Plan 2013-2017. Nairobi, Kenya: Government Printers.
 xi. GoK, (2004). National Policy for the sustainable Development of the Arid and   Semi Arid Lands of Kenya, p 8-11. Nairobi, Kenya.
xii. GoK, (2010). National Climate Change Response Strategy. Ministry of Environment and Mineral Resources. Nairobi, Kenya.
xiii. GoK, (2014). Draft National Climate Change Framework Policy (Version of 22 September 2014). Ministry of Environment, Water and Natural Resources: State Department of Environment and   Natural Resources. Government Printers: Nairobi, Kenya.
xiv. GoK (2016). Climate Risk Profile for Homa Bay County. Kenya County Climate Risk Profile Series. The Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya.
xv. Hargreaves, I., Lewis, J. and Speers, T. (2003). Towards a Better Map: Science, the public and the media. London: Economic and Social Research Council.
xvi. IPCC, (2007a): Summary for Policymakers. In: Climate Change 2007: Impacts, Adaptation and   Vulnerability. Contribution of Working Group II to the Fourth Assessment Report   of the Intergovernmental Panel on Climate   Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.
xvii. IPCC, (2007b). Climate change 2007: synthesis report. Cambridge University Press, Cambridge, UK.
xviii. Kabir, M.I., Rahman, B., Smith, W., Lusha, M.A., Azim,S. and Milton, A.H. (2016). Knowledge and perception about climate change and human health: findings from a baseline survey among vulnerable communities in Bangladesh. BioMed Central, **16**:266. Accessed 20/06/2016.
xix. KNBS (2009). Population and Housing Census, Bungoma County projections. Nairobi, Kenya: Government Printers.
xx. Legesse, B., Ayele, Y. and Bewket, W. (2013). Smallholder Farmers Perceptions and Adaptation to Climate Variability and Climate Change in Doba District, West Hararghe,   Ethiopia. Asian Journal of Empirical Research 3(3):251-265.
xxi. Read, D., Bostrom, A., Morgan, M. G., et al. (1994). What do people know about global climate change? 2. Survey studies of educated laypeople. Risk Analysis, 14, (6), 971-982.
xxii. Wiesmann, U., Samoei, P., Trechsel, L., Engesser, M. (2015). A socio-economic atlas for informed decision-making. In: Ehrensperger A, Ott C, Wiesmann U, editors. Eastern and Southern Africa Partnership Programme: Highlights from 15 Years of Joint Action for Sustainable Development. Bern, Switzerland: Centre for Development and Environment (CDE), University of Bern, with Bern Open Publishing (BOP), pp. 95–98. http://doi.org/10.7892/boris.72023.
xxiii. World Bank. (2010a). Development in a Changing Climate: Concept note. Washington, DC: World Bank.
xxiv. Yusuf, S. A., Adesanoye, A. O. and Awotide, D. O. (2008). Assessment of Poverty among Urban Farmers in Ibadan Metropolis, Nigeria., 24(3), 201–207.