







PERCEPTION AND IMPACTS TO CLIMATE EMERGENCY IN MAIDUGURI URBAN, NORTH-EAST NIGERIA: A CASE FOR COMMUNITY BASED ADAPTATION APPROACH

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ABSTRACT

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Presently, a global climate emergency has been declared due to human lifestyles that have released anti- friendly gases into the atmosphere. This timely study captures the vulnerable climate aggression in Northern Nigeria and the need for adaptation for formidable climate actions. The study assessed the climate emergency perception using a community based adaptation/participatory approach in Maiduguri urban. The study employed the use of survey approach which included the random sampling of 300 structured questionnaires, observation, focus group discussion and interview of key informants. Findings from the study showed that 60% of the residents were aware of climate crisis especially in high income areas. Also, 24.7%, 19.3%, 18% and 17% agreed that deforestation; household activities, industrialization and urbanization are major factors that aid climate change in the study area respectively. Findings from FGD and oral interviews showed that there is increased temperature, rainfall unpredictability and heat intensity. Further, they indicated that the increased heat seasons have triggered health risks in low income areas affecting mostly young children and the aged. The study also revealed that only 9% of the respondents were women while 81% were men. Obviously, the little role of women may be a huge setback on taking adaptive climate actions since 86% of respondents agreed that household activities are a major contributor to climate emergency. To address this challenge this study recommended the Community based adaptation/participatory strategy (CBA/P) which is all inclusive and participatory tool that will promote the health and well-being of the community from climate crisis.

Contribution/Originality: This study is one of very few studies which have identified the community based adaptation approach as the best adaptation strategy to the impacts of climate emergency in urban Maiduguri.

1. INTRODUCTION

Steady rise in global average temperature, rising sea levels, continuous extension of desert areas and shifting weather patterns are threatening the existence of man and ecosystems on earth. The effects and impacts of climate

change are unprecedented in scale and a global threat. If precautions are not taken quite early, adapting to these impacts will be quite difficult. Climate is defined as the average weather conditions of a given location over a long period of time; therefore, climate change can be referred to as a process of global heating, attributable to greenhouse gases generated by the activities of man. [United Nations Framework Convention on Climate Change \[1\]](#) also defined climate change as a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.

Climate change is one of the serious environmental crises which stand as an impediment to achieving the sustainable development goals (SDG's). Despite calculated attempts to de-emphasize the realities of climate change [\[2\]](#) there is sufficient scientific proof that climate change is occurring and its effects felt in various but interconnected scales [\[3\]; \[4\]; \[5\]](#). This corroborates [\[6\]](#) submission that the Intergovernmental Panel on Climate Change (IPCC) has published Climate change assessment reports five times, comprehensively explaining the scientific evidence and attributions of climate change, the impact and risk, mitigation and adaptation, as well as policy and negotiation. This is evidenced by increasing problems in food security [\[7\]; \[8\]](#) air quality [\[9\]; \[10\]](#) water quality [\[11\]](#) among others.

Perception is an essential aspect of communities because a misconception of climate change has undesirable effects that may lead to further destruction of the natural and physical environment. Moreover, the perception of residents on climate change largely determines the way and manner they respond to the impacts of climate change. Perception in this study refers to the way residents understand, identify and interpret observations and concepts of the changing climate [\[6\]](#).

People base their perception on personal experiences, knowledge and character [McDonald \[12\]](#). [Woods, et al. \[13\]](#) asserts that empirical evidence has shown that resident's perception of climate change is positively correlated with adaptive behavior. [Hitayezu, et al. \[14\]](#) added that raising public awareness of the threats of climate change has become a common commitment to global action towards realizable adaptation measures. Adaptation should be an instrument made for human, ecological or physical system in response to a perceived vulnerability that exploits beneficial opportunities [U.S. Environmental Protection Agency \[15\]](#) and [Intergovernmental Panel on Climate \(IPCC\) \[16\]](#).

Hence, adaptation to climate change in Nigeria is therefore a primary necessity since climate change is a present dilemma. It requires quick and sustainable measures that should address the impacts of global heating and also monitor causative- human activities that increase gaseous emissions. The concept of Community-based adaptation (CBA) as an action research is an appropriate strategy that would best provide appropriate means to deal with climate crisis especially in global South. Nigeria is susceptible to climate impacts such as floods, drought, heat waves, and food insecurity among others. CBA strategy to climate change is an approach to adaptation that aims to include vulnerable people in the design and implementation of adaption measures. They include simple but accessible technologies such as water storage, rainwater harvesting and so on. It also includes more complex forms of social and economic resilience such as reducing the vulnerability of social groups that are especially exposed to climate risks or increasing other forms of livelihood.

1.1. Statement of Problem

The impacts of climate change have been felt by both global South and North countries. Africa countries are likely to suffer the most because of their geographical location, low income, low institutional capacity as well as their immense dependence on natural resource for livelihood. The impacts of changing climate have been drastic with more than two thirds of the country prone to desertification [\[17\]](#). Similarly, [Mohammad \[18\]](#) reports that desert, which now covers about 35 percent of Nigeria's land mass, is advancing at an estimated 0.6 km per annum, while deforestation is taking place at 3.5 percent per annum. The study area Maiduguri is located in the Northern

Nigerian within arid and semi arid areas characterized with low rainfall and less vegetation cover. This is confirmed by the study carried out by Odjugo and Isi [19]; Odjugo [20]; Odjugo and Akpodiogaga-a [21] on increasing temperatures and decreasing rainfall in Northern Nigeria. The semi-arid regions are located in Sokoto, Kano, Nguru and Maiduguri where evapo-transpiration, drought, desertification and drying up of rivers are taking place. The advancement of climatic crisis has further worsened the available water, vegetation and agricultural production. Mohammad [18] confirms that the desert belt has moved from Kebbi, Kano, Maiduguri to New Bussa, Kaduna, Jos, and Sheleng while Savannah now interfaces between desert and forest along Oyo, Osun, Kogi and Benue states.

Some of the daily activities of residents of African cities such as bush burning, household activities, open refuse burning, smoke from vehicles and motorcycle exhaust pipes among other said global warming which ultimately leads to climate change. However, it is not clear whether urban residents are aware that some of their day-to-day activities contribute to the emission of Green House Gases (GHGs) in the atmosphere and hence climate change becomes unavoidable [22]. Unfortunately, studies have shown that climate change awareness in African countries is poor [23]; [24]; [25].

It is also not clear whether they are concerned about climate change and whether this influences their decision to take adaptation measures [5]. Sustainable adaptation options are necessary to combat the aggressive consequences of climate change in the Northern Nigeria and globally Akanwa, et al. [26] and Akanwa, et al. [27]. It is against this backdrop that this study seeks to investigate the perception, impacts and community based adaptation approach to climate emergency in urban town of Maiduguri, Nigeria with the following objectives:

1. To determine the level of perception of climate emergency in urban Maiduguri.
2. To identify the major climate impacts in the study area.
3. To assess gender community participation levels to adaptation options.
4. To proffer the best adaptation measures to minimize climate problems.

1.2. Study Area

Maiduguri is the capital of Borno State and it is located between latitudes $11^{\circ}46'18''\text{N}$ and $11^{\circ}53'21''\text{N}$ and longitudes $13^{\circ}02'23''\text{E}$ and $13^{\circ}14'19''\text{E}$, Maiduguri sits on the seasonal Ngadda River that empties into the Lake Chad in the areas around Northern Borno. The word Maiduguri is coined from two Kanuri words; "Mai" which means king and "Duwuri" which means thousands. The word "Maiduwuri" was corrupted to "Maiduguri" by the colonial masters. Maiduguri also known as "Yerwa" by locals, occupies an area of 50,778 Km^2 [28] making it the largest city in North East Nigeria [29]. Maiduguri, located in the Sudan Savannah region has an average relief ranging between 300m and 600m above sea level. Generally, the mean monthly temperature is always above 20°C but the daily extremes vary in a wide range reaching up to 47°C in April [30]. The National Population Commission (NPC) gave the 2006 population of Maiduguri as 621,492 with a density of 1145 persons per square km which makes it the most densely populated city in North Eastern Nigeria [31]. Figure 1 shows the map of Maiduguri urban.

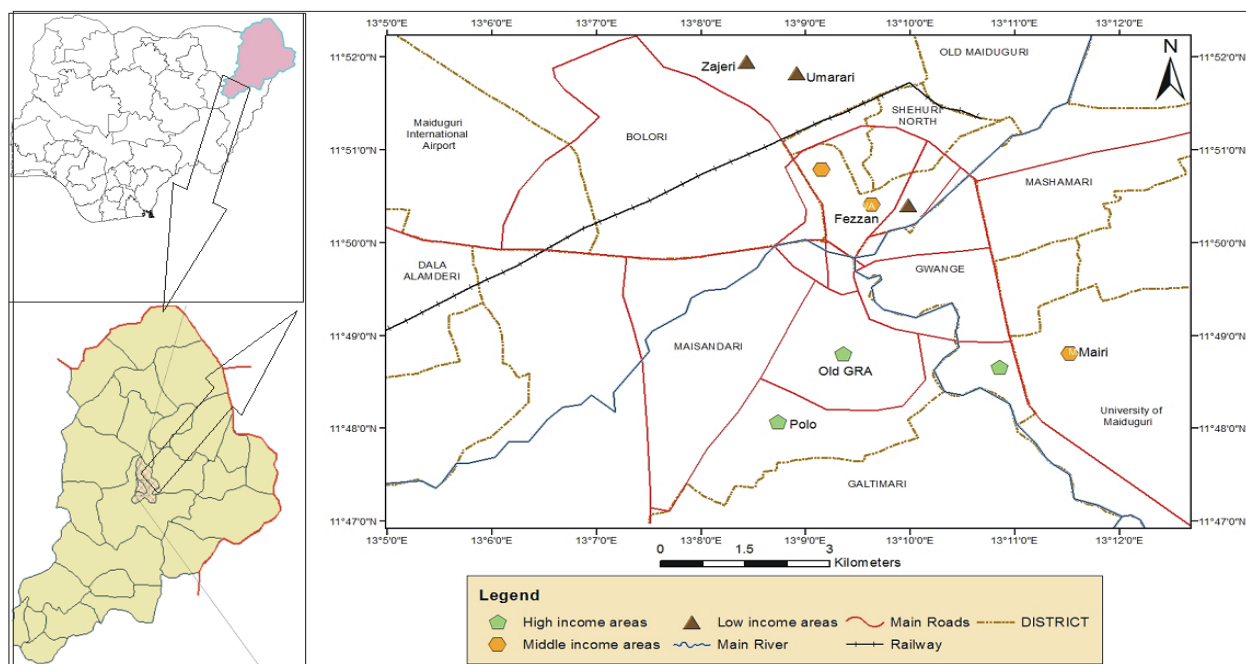


Figure-1. Map of Maiduguri urban showing the study area.

Source: Department of Geography, University of Maiduguri GIS lab.

2. MATERIALS AND METHOD

2.1. Study Population

The study was conducted through a cross-sectional survey targeting Maiduguri urban residents. The study covered the three socio-economic strata of residential areas in Maiduguri urban which are; low income areas (Umarari, Zajeri, Adam Kolo), middle income areas (Mairi, Mafoni and Fezzan) and high -income areas (New GRA, Old GRA and Polo). As adopted from Okaka and Odhiambo [5] stratified sampling was used to ensure that the three categories of residents were represented in the sample. After stratifying the residential areas, systematic random sampling was also employed in selecting a total of 300 respondents.

2.2. Method of Data Collection

Data was collected through primary and secondary sources. The primary data for this study was collected from the administration of 300 questionnaires. The data included responses on food security, temperature change, health, availability of water and residents' socio-economic characteristics. These were processed from information gathered through 300 randomly administered questionnaires within urban Maiduguri. The questionnaire was further complemented by ten (10) Focus Group Discussions (FGDs). Purposive sampling method was employed to select the ten participants for the FGDs. They were purposively drawn from the pool of respondents that participated in the survey based on the analysis of their responses.

Data collected was analyzed both qualitatively and quantitatively. Data collected from the FGDs was first transcribed from Hausa to English in some cases while in some other cases, the responses was transcribed from Kanuri to English and then organized them into themes. The quantitative analysis involved descriptive analysis which was graphically presented in charts, tables and graphs.

3. RESULTS AND DISCUSSION

The sexes of the respondents showed that majority of the respondents were males (81%) while women accounted for only 9%. This showed that more men participated as respondents in the research process than women. This immense gap between men and women involvement can be related to the influence of conservative cultural expectations of women roles and their response to outdoor activities. This buttresses the necessity for

strategies for translational advocacy, education on women roles that is inclusive in empowerment [32] and necessary in collaborative efforts towards minimizing climate change. The study also revealed the age structure of the respondents whereby, 51% of the respondents were in the age bracket of 46-55years, while 23%, 18% and 8% were within the age bracket of 30-45, 56-65 and 66years above respectively. This showed that majority of the respondents were adults (46-55years) and matured to provide necessary information on the study; however, the need for younger adults becomes vital for sustainability approaches against the damaging impact of climate change.

The study identified the educational qualification of respondents, showing that 43% attended the Tsangaya system of education, primary and secondary school qualifications accounted for 19% and 20% respectively, while post-secondary educational qualification accounted for 18%. The Tsangaya system is the common traditional system of education in Northern Nigeria and also referred to as the almajiri system of education which is spoken in Hausa language, but written in Arabic Alphabet. This is an indication that majority of the respondents could read and write. This enabled the respondents to identify the major causes of climate emergency (see Table 1; deforestation, household activities, industrialization and urbanization) and impacts as well. This is confirmed in a similar study by Akanwa and Ezeomodo [7] where one of the objectives of the study was to examine the level of perception of rural farmers to climate change in Anambra State, Nigeria. Their study revealed that only 52% had secondary school qualification, but were able to perceive climate variability. Obviously, the catastrophic weather occurrences on the natural and physical environment are able to jolt their perception levels and heighten their environmental sensitivity.

The study also revealed that the largest proportion of the respondents 58% have lived in the study area between 31-40years, 21% of them have lived in the area between 21-30years while 16% and 5% have lived in the area between 10-20 and 41years above respectively. As McDonald [12] rightly observed that people base their perception upon their personal experiences, knowledge and character. This is an indication that the respondents were familiar with the climate trends of the area having lived there for (31-40 years) to perceive these changes and subsequent impacts. The socio-demographic characteristics of the respondents are shown in Figure 2.

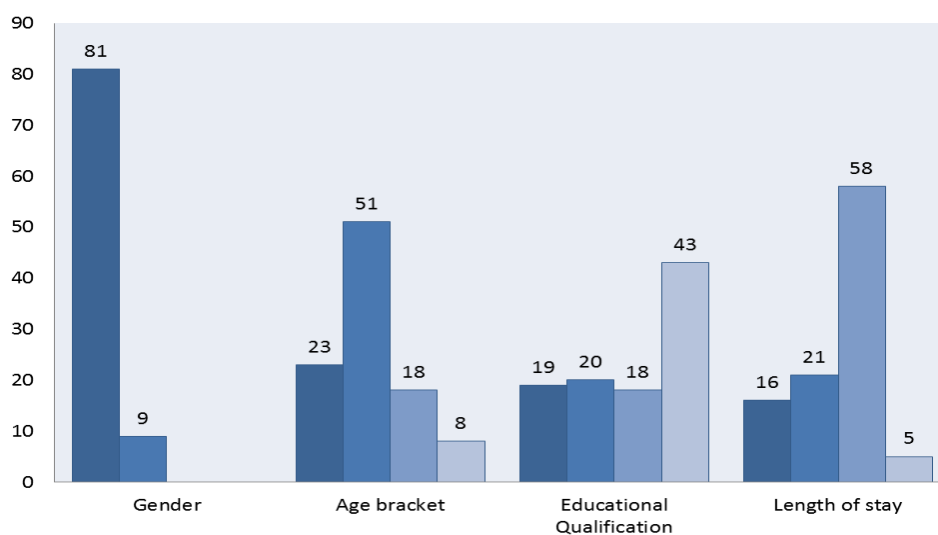


Figure-2. Socio-demographic characteristics of respondents.

Source: Fieldwork 2019.

Further, findings showed in Figure 3 that Radio/television/Newspaper represented 63% which was the largest source of information on climate change, while the internet showed 3% which was the least percentage in residents' source of information on climate change. This indicated that the respondents could read and write to harvest information on climate change based on the available means of information dissemination peculiar to them.

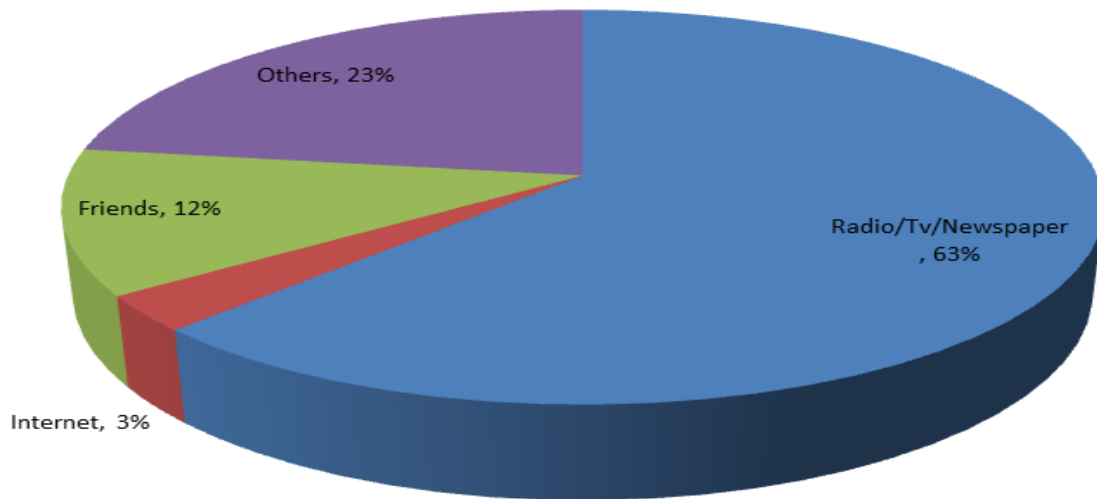


Figure-3. Residents source of information on climate change.

Source: Fieldwork 2019.

The residents' perception levels were identified in Figure 4. This was achieved by examining whether they were aware of climate change occurrence in their community. From our findings, 36% of respondents strongly agreed that they were aware of climate change occurrence, while 24% of respondents agreed to climate change emergency. However, 33% were uncertain and 7% were undecided. This means that 60% of the sampled population is aware to the changing climate in the study area. Interestingly, comparison by the three residential areas in Maiduguri urban indicated that the level of awareness on climate change occurrence were high in high income areas (New GRA, Old GRA and Polo), followed by middle income areas and low income areas.

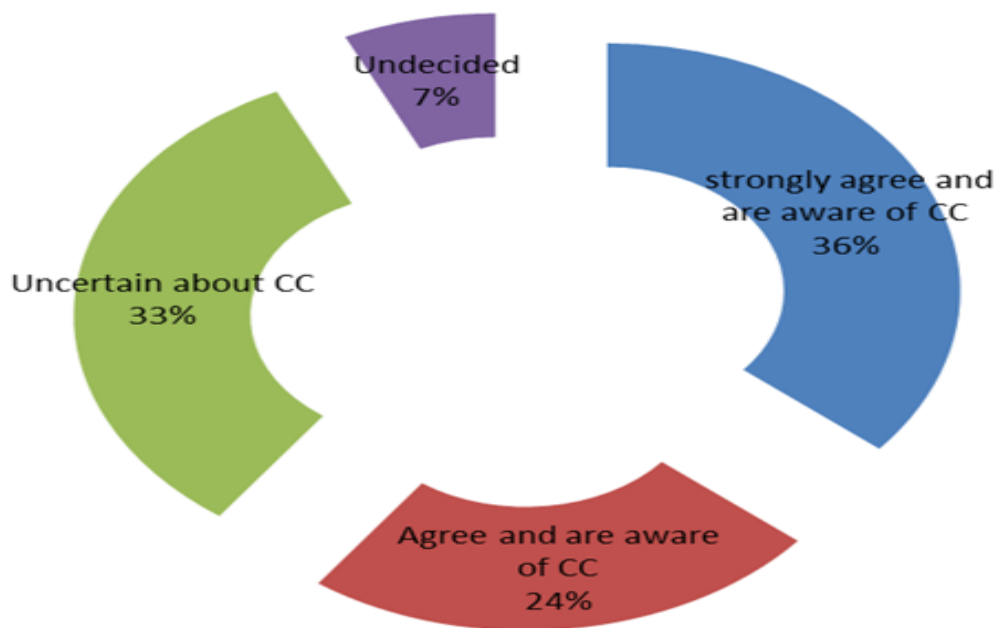


Figure-4. Residents awareness of climate change.

Source: Fieldwork 2019.

Further, results from the study see Table 1 showed the residents awareness of the causes of climate change in the area. The results indicated that 24.7%, 19.3%, 18% and 17% agreed that deforestation; household activities, industrialization and urbanization are the chief causes of climate change in Maiduguri urban respectively. However, 11% and 10% indicated that population increase and vehicle emissions were also among the least causes of climate change. This showed that major human actions that increase the release of gaseous emissions were deforestation, household activities, industrialization and urbanization respectively. This results agrees with other studies carried

out by Farauta, et al. [17] and Mohammad [18] that Northern regions in Nigeria are heavily deforested and degraded by human actions hence, increasing global heating.

Table-1. Residents awareness on the causes of climate change.

Causes of climate change	Frequency	Percentage (%)
Deforestation	58	24.7
Household activities	74	19.3
Urbanization	51	17
Population Increase	33	11
Vehicular Emission	30	10
Industrial Activities	54	18
Total	300	100

Source: Field survey, 2019.

The findings also noted in Table 2 that 20%, 19.3%, 13.3%, 11.3% indicated that increased heat intensity, health risks, increased desert encroachment and extended periods of dry season were the major impacts of climate change respectively. However, 10%, 8.6%, 8.6%, 6% and 3% showed that shrinking water bodies, shorter periods of rainfall, reduced crop yield and flooding respectively were also other evidences of climate change in the study area. Further, it was noted that the health risks were evident in low income areas (Umarari, Zajeri, Adam Kolo) affecting mostly children and the aged in the area. The health problems were dehydration, heat rashes, Meningitis, restlessness and discomfort, respiratory problems, heat stroke. These results on impacts of climate change is confirmed by other studies carried out in different parts of the country: Odjugo and Isi [19]; Odjugo [20]; Odjugo and Akpodiogaga-a [21]; Akanwa and Ezeomede [7]; Mohammad [18]; Ekpoh [33]; Chindo and Nyelong [34]; Odjugo [35]; Odjugo [36] and Molega [37] among others.

Table-2. The impact of climate change in the study area.

Evidences of climate change	Frequency	Percentages (%)
Increase in heat intensity	60	20
Flooding	8	3
Extended Dry Seasons	34	11.3
Shorter period of rainy seasons	26	8.6
Increase in rain intensity during wet season	18	6
Increased desert encroachment	40	13.3
Shrinking of water bodies	30	10
Reduced Crop Yield	26	8.6
Health Risks	58	19.3
Total	300	100

Source: Field survey 2019.

Results from FGD and interviews identified the present adaptive strategies employed by the residents to minimize the impact of climate change. These adaptation practices were observed in four (4) key areas namely; increase in surface temperature, health risks, food security and water supply. The residents indicated that to cushion the effect of increased temperatures measures such as wearing light clothing, use of air conditioners, bathing multiple times a day, drinking lots of cold water, urban farming and planting flowers were practiced. For food security, the most common adaptive strategies are early planting, irrigation farming, use of food ripeners and mixed cropping, While for water supply, borehole/well sinking, rainwater harvesting, storage tanks, reuse of wastewater, controlled water use were observed. Most of these adaptation techniques were also confirmed by studies carried out by Akanwa and Ezeomede [7]; Akanwa, et al. [26] and Akanwa, et al. [27]. Finally, for health risks, multiple baths, use of cooling systems, light clothing, ventilated living areas, use of mosquito nets, and planting of trees were observed in the area. Comparison by residential areas showed some variations in adaptation strategies. For instance, use of air conditioning systems was quite common in the highbrow areas (New GRA, Old GRA and Polo) of

Maiduguri urban as almost all residential buildings are fitted with multiple air conditioning systems. This is a far cry from what is obtainable in the low-income areas of Maiduguri Urban. Furthermore, reuse of waste water was very common in the low-income areas, fair in middle income areas and very low in high income areas. Riebsame [38] observed that measuring individuals' perceptions and activities provide insights into how people see and adjust to climate change and variability, thus this information is relevant to climate change studies and forecasting future adaptive projection. The means of training and education on climate emergency so that communities can play important roles in the implementation of adaptive strategies. This will enable the relevant authorities charged with the responsibility of policy making and decision process to modify mans activities in order, to minimize the effect of global heating. Importantly, gender equality and women empowerment are crucial to the success of development, environmental sustainability and women participatory roles in climate change adaptation.

4. CONCLUSION

This study examined the perception, impacts and community based adaptation approach to climate emergency in Maiduguri urban, Nigeria. Findings from the study showed that majority of the residents 60% were aware of climate crisis especially in high income areas (GRA, Old GRA and Polo). It was also noted that the major causes of changing climate in the area were identified as deforestation (24.7%), household activities (19.3%), industrialization (18%) and urbanization (17%). Findings also showed that climate crisis identified in the area were increased temperature, rainfall unpredictability, heat intensity and climate-health issues. The residents agreed from the FGD that the increased heat seasons have triggered health risks especially in low income areas (Umarari, Zajeri, Adam Kolo). This has affected mostly young children and the aged. The health problems prevalent were dehydration, restlessness and discomfort, Meningitis, respiratory problems and heat stroke.

The study also revealed that only 9% of the respondents were women while 81% were men. Obviously, the little or non-participatory role of women may be a huge setback towards sustainable adaptive climate actions since 86% of respondents agreed that household activities is a major contributor to climate emergency. To address this challenge especially in Northern Nigeria where women participatory levels are low [39] as also observed from this study, there is a crucial need for an action research project. Community Based Participatory Research (CBPR) as an action project embraces realities around participation, transformation, benefaction, co-construction of knowledge between community and academia with social justice. As defined by Kellogg Health Scholars [40] Community Based Participatory Research (CBPR) is "a collaborative process that equitably involves all partners in the research process and recognizes the unique strengths that each brings. CBPR is particularly consistent with the goals of sustainable development since it impacts on the economic, political, ecological, gender and socio-cultural aspects of the community.

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