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# Self-protective Measures against Climate Hazards in Ghana: The Case of Dansoman in the Greater Accra Region

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## ABSTRACT

Self-mitigation and adaptation often require conceptual and feasible innovative mechanisms, locally designed with inputs from key stakeholders. Developing prudent adaptation measures for local communities are often time-consuming, and require in-depth analysis due to the complex nature of climate change, encompassing several sectors and external facilitators. In our quest to achieve Millennium Sustainable Development Goal (SDG 13), placing communities in acute and highly vulnerable locations at the center are essential in determining critical and actual areas stemming these communities, hence, employing bottom-up approach in realizing global goals of regulating deteriorating climatic conditions. The ultimate aim of the study was to find-out self-protective measures, initiated by key proponents in the area. The study employed an action-based, descriptive and inferential statistics in the collection and analysis of data. Response from informants constituting officials from various institutions and vulnerable groups in the area were subjected to content analysis to avoid misjudgments. Results show majority of self-protective measures, initiated by proponents in the area are short-term (reactive) measures which does not have the efficacy and capacity to deal with large scale climate events of greater magnitude and intensity. The study would inform the decision of policy-makers and interested stakeholders towards achieving SDG 13 as well as critical areas to prioritize, both in the short and long term. Further research could be conducted on the extent to which enhancing socio-economic parameters in the area can amplify residents' susceptibility to climate hazards in the long run.

*Keywords: Self-protective; Dansoman; Accra; Ablekuma-west; potential impacts; reactive; anticipatory.*

## 1. INTRODUCTION

Climate change presents several multi-sectoral challenges that need to be tackled through a holistic, sector driven and interdisciplinary approach. Climate change as a global phenomenon is exacerbating in recent years due to structural transformation of raw economies to manufacturing economies. Current industrialization trend has given more room for alteration of prevailing climate over the past few decades. Potential impacts and policy-options are essential in regulating this global phenomenon. Ghana is signatory to a number of global interventions on climate change and other disasters. For instance, the United Nations Framework Convention on Climate Change (UNFCCC), expects national governments to integrate climate change issues into national development frameworks [1,2]. Similarly, Ghana signed for the Hyogo Framework for Action (HFA) 2005-2015 and Sendai Hyogo Framework

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for Action (SFA) 2015-2030: Building the Resilience of Nations and Communities to Disasters. The frameworks aimed at reducing casualties as well as socio-economic and environmental losses resulting from natural disasters, in a sustainable manner [3].

Ghana's initiative towards integrating climate adaptation into policies and strategies commenced little over twenty-three (23) years ago under the Netherlands Climate Change Study Assistance Program [4]. This support and many others including UNDP's supported Climate Change-Dare Program led to the formulation of the National Climate Change Adaptation Strategy (2011), streamlining climate change adaptation into Ghana's Shared Growth and Development Agenda 2010-2013 and 2014-2017. The National Climate Change Adaptation Strategy was transformed into a National Climate Change Policy in 2014 to guide the processes, leading to streamlining climate into national policies, strategies and programs. Before a national policy framework is approved as a working document, it is ensured that issues of Climate Change (CC) and Disaster Risk Reductions (DRR) are prominently featured. More importantly, CC/DRR issues have to be accepted as a national priority and a *sine qua non* to sustainable development [5]. Consequently, third world countries (least developed countries) in Africa, central and south-eastern Asia, and other parts of the world have the least capacity to cope or adapt to natural stress, shocks and disturbances emanating from climate change. Countries and social groups' degree of vulnerability maybe attributed to some key climate determinants, thus, exposure and sensitivity factors such as; geographical location, social class, alternative livelihood sources, infrastructure, strength of institutions and availability of climate information, policy frameworks amongst others [6]. This study sought to determine adaptive measures initiated by the local assembly, private entities and individual households in reducing climate vulnerability in the study area. In addition, it projects current and future impacts along with adaptation mechanisms, already initiated by individual households, private entities and the local assembly. Bridging this study gap in the study area tends to answer "what", "how" and "why" bottom-line questions related to climate vulnerability in the area. This eventually informs future decisions and serve as a baseline study for further research on quantitative assessments, linked to cost of adaptation and cost-benefit analysis against other socio-economic factors.

## **2. MATERIALS AND METHODS**

The study employed a mixture of qualitative and quantitative strategies in its collection and analyzing of data. Descriptive and exploratory based research strategies were adopted for this single case study as they were deemed somewhat reliable in answering questions like "why" and "how". Qualitative techniques like; questionnaires, interviewing and observations based on respondents' experience, knowledge and personal assessment, through active participation were employed. The study does not measure vulnerability but resorted to officials and vulnerable groups' knowledge, observations and assessment on climate impacts and adaptation.

### **2.1 Sampling Size and Procedure**

Two different sets of questionnaires were administered among local residents and some officials in the area. Out of this total (210), two hundred (200) were being administered among local residents with the remainder, 10 being administered to officials. These officials are elites, working in different institutions relevant in providing the needed information in achieving the objective of the study. Target group were classified as vulnerable groups based on their occupation, social stratification (status), gender and geographical location. The sample size entailed the elite who work within various institutions like; Environmental Protection Agency (EPA), National Disaster and Management Organization (NADMO), Accra Metropolitan Assembly (AMA), Ablekuma West District Assembly, fishery Unions and co-operatives, Premix Fuel Dealers Association in Dansoman, Dansoman house of chiefs/Traditional council and non-governmental institutions like; Institute of Green Growth Solutions. Other members on sampling representation were members of pressure groups, fishermen and farmers, educational staff, fishmongers, residents living along the coast of Dansoman, traders and so on. Purposive, random and probabilistic sampling methodologies were employed.

## **2.2 Data Analysis**

Quantitative tools like; Microsoft excel worksheet and Statistical Package for Social Sciences (SPSS) were adopted for analyzing and presentation of study findings. Household and institutional survey using open-ended and semi-structured questionnaire were administered in collecting data. A period of 50 minutes to an hour was used in administering a questionnaire to each respondent.

## **2.3 Scope of the Study**

The study area, Dansoman, is a local administrative town in Accra metropolis. It is categorized under Ablekuma-West constituency within Accra Metropolitan Assembly (AMA). Dansoman is approximately 7 km from the central business center of the capital. Dansoman is dominated by a working class, characterized by business and commerce as well as agricultural activities mainly; fishing and farming in its coastal belt. The area is being considered as one of the most diverse areas in Accra in terms of household income and ethnicity [7]. The population of the area is estimated to be 56,267 people [7]. The housing structure in Dansoman is a mix of detached and semi-detached houses and apartments. Dansoman is experiencing rapid growth in terms of urbanization like other major areas in Accra. The area is highly characterized by lower levels of formal infrastructure and a higher degree of informality. The coast of Dansoman has a number of informal urban settlers, constituting squatters and higher density of hood slums. The coastal zone in Dansoman is characterized by a gently sloping shoreline and a sandy beach.

The area is high characterized by the Ga who are natives from the Greater Accra region followed by Akans as well as other natives from different regions. Occupants within the study area have legal possession of land under the Land act along with increasing urban dwellers and hood slums along the coast due to housing deficit in Ghana, high cost of rent and purchasing of lands. Majority of residents along the coast of Dansoman without legal rights in residing in such areas claim to have resided in the area for lengthy period bearing “traditional rights” of ownership as their great grandparents resided in the area. The area is governed by two administrative authorities. The area was selected for the study based on its geographical location or proximity to the sea, recent evidence and trend of climate events in some unit areas like; Gbegbeyise, Glefe, Panbros and Mpoase, limited climate information and policy framework in Dansoman.

### **2.3.1 The traditional authority**

The traditional system of governance deals with local issues pertaining to land tenure systems, customs, social norms and values which constitute; culture and traditions. The traditional authority mainly constitutes the paramount chief of the area, sub-chiefs who are often known as “elders”, linguists, maidens, palace guards, gong-beaters (information carriers/town criers) and other locals who are of service to the royal lineage. The elders and other palace staff hail from various households within the community where the chief rules. Sub-chiefs or elders who assist the chief in daily administration of the area are often key representatives from both nuclear and extended families in the area. These representatives are knowledgeable, well-experienced, have public trust and have attained some level of social class, hence, aids in information flow from the top to the bottom within the traditional hierarchy system of planning and decision-making. This system was highly dominant in the 1950s when the dual system of governance was practiced (central government dealt directly with the traditional system) for development of most areas in Ghana.

### **2.3.2 The political authority (Local government system)**

Political authority, on the other hand, plays the role of central government through decentralization in the day to day administration at the local level. Local areas in Ghana are categorized under Metropolitan, Municipal and District Assemblies depending on the size of population and resources available in the area. The political authority which is also known as the local assembly or government constitutes the District Chief Executive (DCE) who is a central government appointee, district coordinator, presiding and assembly members who are being elected by the local people, representing various unit areas. Other members are; member-of-parliament elected and serves as

people's representative at the national parliament house as well as independent civil servants without any political affiliation assigned with some specific duties. This authority is meant to ensure law and order, formulate, implement and enforce various policies and action plans, aimed at enhancing people's welfare. The system gained more popularity in 1980s as various local assemblies were vested with power to manage resources effectively for the development at the local level. The system became popular when the dual hierarchy system was fading out. People lost trust and confidence in the traditional system. The reasons attributed to these were corruption and traditional authorities, siding with the central government and not serving as mouthpiece of the people they represent. Despite these bottlenecks in some special cases, these two authorities complement each other in most cases on daily administration of activities in the area. Integration of these two authorities have led to the avoidance of several conflicts which may have emanated and hampered the development of most areas.

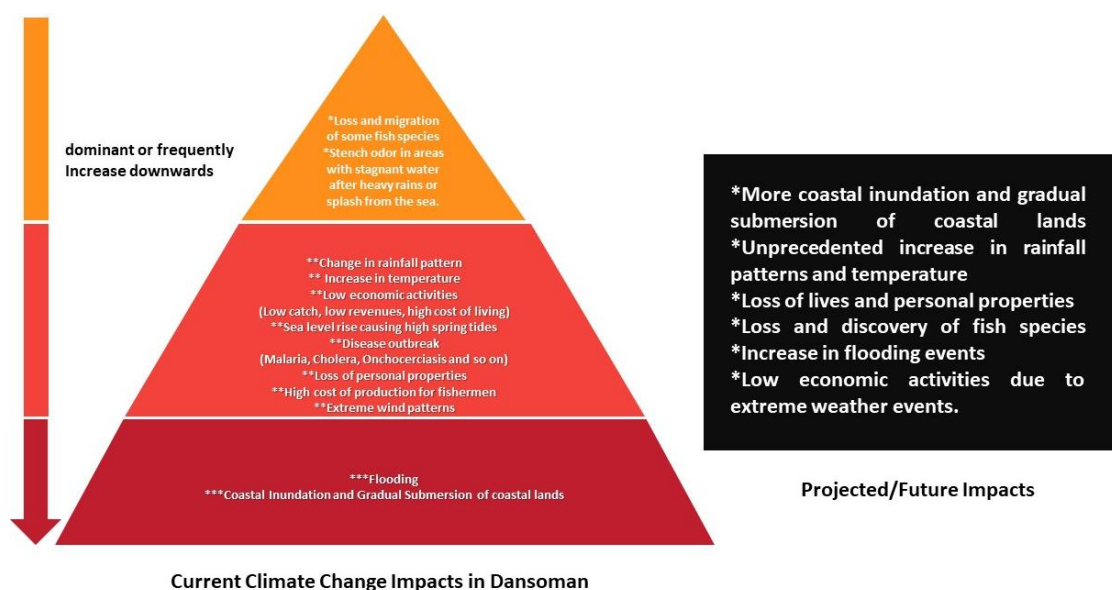


**Fig. 1. Satellite image of the study area**  
*Source: Google Earth Satellite data [8]*

### **3. RESULTS**

#### **3.1 Potential Impacts of Climate Change in Dansoman**

Dansoman has relatively an open coast that enables considerably strong unimpeded swell waves to reach the coast. Using the coast of Dansoman as a single case study area was apt due to increasing trends and evidence of climate change events, namely; flooding, spring tides, sea-level rise causing coastal erosion, disease break-out, inundation and gradual submersion in the area. Dansoman is one of the most populous areas within the Accra Metropolis, with several livelihoods dependent on fishing and agricultural activities both directly and indirectly. The area is known to be one of the most vulnerable areas to climate hazards in the Greater Accra region of Ghana. Findings highlight a number of climate trends and events, bound to occur or are experienced by local residents and officials in the study area.



**Fig. 1.1. Current and potential impacts of climate change in Dansoman respondents view and assessment of climate change impacts in the study area**

\*\*\*Impact most predominant; \*\*Impact is more predominant; \*Impact is dominant

The chart shows existing climate change event occurrence in Dansoman. The figure also presents potential impacts based on respondents' experience and assessment in the area. Impacts with multiple asterisks (\*\*\*) show which impacts or events are dominant or frequently occur in the area and the ones which barely occurs. The figure (Fig. 1.1) was designed using checklist of what respondents believe are dominant or less dominant with recurrent impacts in the study area.

### 3.2 Local Adaptation Strategies in Dansoman

One main research question this study sought to find out was if Ablekuma West District Assembly which has Dansoman as one of its unit areas have a local climate change adaptation policy framework. An official interviewed at the Ablekuma West district assembly, thus, the safety and project unit officer asserted that: "Our area does not have any formalized local climate change adaptation policy framework as a guideline to tackle the issue of climate change". She further stressed on the fact that they were still in the process of formulating a local adaptation strategy after recent climate change events occurrence in the area despite some major interventions had been made. A number of assembly members at Gbegbeyise, Mpoase, Panbros and Glefe unit areas within Dansoman claimed, the limited adaptation projects, initiated by the local assembly were interventions, initiated to bring relief to residents who had experienced coastal inundation and gradual submersion, flooding, disease outbreaks as well as low productivity among fishing folks. They, however, seconded the fact that Dansoman and other areas within the district assembly will soon have a climate change policy directive to avert the adverse impacts of climate events in the area.

**Table 1. Local residents' view on local adaptation strategies initiated by the local assembly or any private entity**

	Frequency	Percentage	Valid percentage
Yes	148	74.0	74.0
No	28	14.0	14.0
I don't Know	24	12.0	12.0
Total	200	100.0	100.0

Table 1 shows the distribution of respondents, mainly local residents, who were asked about adaptation strategies initiated by the local assembly in the area. Out of the total, 74% representing 148 respondents asserted that they knew about some adaptation strategies initiated by the assembly. 14% out of the total respondents said they do not know about any adaptation strategy initiated by the assembly or any private entity in the area. The remaining 6% representing 24 respondents said they do not know if the assembly had such measures in place or not.

**Table 1.1. Officials’ view on local adaptation strategies initiated by the local assembly or any private entity**

	<b>Frequency</b>	<b>Percentage</b>	<b>Valid Percentage</b>
<b>Yes</b>	10	100.0	100.0
<b>Total</b>	10	100.0	100.0

The table above (Table 1.1) shows officials in some institutions view on some initiated adaptation strategies in Dansoman. Per the frequency above, thus, 100% representing 10 respondents indicate officials, attesting to the local assembly and other private entities, initiating some adaptation strategies in the study area.

### **3.2.1 Reactive and anticipatory measures**

#### *3.2.1.1 Short-term (reactive) measures*

Reactive measures in this study can be attributed to short term measures developed by people after the occurrence of a climate hazard or have the notion of possible climate hazards, bound to occur in the short run. Example of short (reactive) adaptation measures deduced from this study were; national sanitation day events, individual household self-protective measures such as: digging canal systems, sand, stone and wood barriers, maintained periodically prior and after an event had occurred (Fig. 1.2). In some instances, people develop these systems, only during periods perceived to be rainy or wet seasons, hence, when an area is often faced with floods, local folks develop these barriers, mostly not cost-intensive compared to large-scale adaptation projects for an entire region initiated by central government or an international donor. Local residents per this perceived notion, annually develop short-term adaptation measures to avoid possible floods and other climate-related impacts.

#### *3.2.1.2 Long (Anticipatory) term measures*

Long (Anticipatory) term measures are often linked to proactive measures, meant to tackle impacts of climate change that are perceived to occur in the long run or future. In other cases, if an area is being faced with a major event or phenomenon which persist over a given period, long term solutions or measures are developed to regulate such issues, consistently occurring in such area. Anticipatory measures according to the no-regret strategy concept are often done on large-scale, capital intensive (costly) and requires time with broader participation and effective planning. Examples of few long term measures initiated in the study area and elsewhere are; sea defense mechanisms (Plate 1), awareness and capacity building programs for general public and officials or civil servants, coastal zoning and development, storage facilities to prevent post-harvest losses, construction and expansion of socio-economic infrastructure like; schools, health facilities, research centers and so on. Anticipatory measures delve into managing the unavoidable in the long term.

Table 1.2 depicts adaptation strategies initiated by both the local assembly and private entities in Dansoman. The distribution above shows limited adaptation strategies initiated in the area by these bodies to significantly reduce the locals’ vulnerability to both short- and long-term impacts of climate change. Among these strategies mentioned by respondents based on findings are:

### **3.2.2 Sea defense systems**

Plate 1 shows sea defense system along the coast of Dansoman. This mechanism was developed against findings, highlighted in Fig. 1.1, on some impacts of climate events in Dansoman. Among



such dominant impacts are; coastal erosion, inundation and gradual submersion of land resulting from high spring tides (sea level rise) and extreme weather patterns which affect personal properties and people’s livelihoods.

**Table 1.2. Some adaptation strategies initiated by the central government through Ablekuma west district assembly and other private entities in Dansoman**

	<b>Local assembly</b>	<b>Private entities</b>
<b>Dansoman</b>	Sea defense system	Awareness and capacity building programs initiated by Dansoman fishery union and co-operatives as well as Dansoman Premix dealers association
	Sanitation activities/events like; National sanitation day	Provision of support/items by faith and community based organizations (FBOs and CBOs) to its members and not the entire victims, affected by the large scale events like; flood.
	Distribution of trash-bins	



**Plate 1. Sea defense system along the coast of Dansoman**



**Plate 1.1. Sea defense under extension along the coast of Dansoman**



**Plate 1.2. Stagnant water (pool of water behind the sea-defense) resulting from water splashed against the sea defense**

Plate 1.2 illustrates stagnant water behind the sea defense resulting from water splashed from the waves due to amplification of the wind as well as rise in sea level during rainy seasons, thereby causing high tides. Unprecedented and fluctuations in rainfall patterns in recent years based on findings, show stagnant water are formed periodically in most parts, hence, results in the breeding of mosquitoes and other worm infections. The sea defense being an adaptation mechanism initiated by the local assembly caused unintended consequences like; breeding of mosquitoes, cholera, worm infections and so on among local residents living along the coast. This mechanism which brought relief to locals end up generating another simultaneously, hence, can be linked to mal-adaptation under the no-regret strategy concept if care and adequate plans are not effectively formulated, implemented and evaluated.

### **3.2.3 National sanitation day**

The National Sanitation day event which turns out to be carried out on first Saturday of every month across regions in Ghana was a key initiative in addressing sanitation issues. Choked drainage systems are cleared for easy passage of water during heavy rains to avoid flooding, destruction of personal properties and disease outbreaks. The National Sanitation day was declared on November 1<sup>st</sup>, 2014 by the Government of Ghana (GoG) after cholera outbreak in most areas including Dansoman hence, the need for this event to ensure sanity and in preventing conditions that breed diseases. Being an initiative by the Ministry of local government and rural development, a bill was recently passed into law to punish individuals, who fail to regard this day and act accordingly. Respondents in Tables 1, 1.1 and 1.2 asserted that the sanitation day event was embraced among locals as a key adaptation mechanism to clear drainage systems, prevent floods after recent unprecedented heavy rains, choked gutters which breed mosquitoes as well as causing other diseases in the area. This, in essence, will reduce the locals' susceptibility to floods after heavy rains, diseases outbreak and so on.

Currently, the National Sanitation Day exercise which was scheduled, first Saturday of every month, is not embraced as compared to when the policy was initiated. The diminishing impact or significance of this activity has resulted to most drainage systems, choked with solid waste, sediments amongst others.

### **3.2.4 Distribution of waste bins**

A senior member of National Disaster and Management Organization (NADMO), who occurs to be the assembly member, representing the entire unit area of Gbegbeyise and Glefe opined that the local assembly distributed waste bins to individual households and some specific community zones to encourage the habit of keeping their surroundings clean. This prevents people from dumping refuse



into gutters or drainage systems resulting to flooding in most areas when choked with solids or plastic waste and sediments, hence, inability for easy passage of storm-water through drainage systems after heavy rains. The storm water eventually finds its way into people's homes and farmlands. Other interviewees during the course of data collection opined that waste bins which were distributed in the area were inadequate. The intended purpose was not fruitful due to delays in picking up waste by waste management agencies. This results in the accumulation of waste, which propel some residents to dispose waste into the sea or nearby lagoons, rivers and drainage systems. Citing the Chemu lagoon and drainage systems within Dansoman and its environs as examples (see Appendix I).

### **3.2.5 Awareness creation and capacity building**

Officials interviewed within the aforementioned institutions in section 2.0 asserted capacity building programs on climate change and its related events were organized for them through workshops. Dansoman fishery unions and co-operatives, mainly private entities had initiated some awareness and capacity building programs among its members. Some fishing folks belonging to these unions attested to such programs initiated in sensitizing them on climate events and its relation to their economic activities. Results show 40% representing 80 respondents out of the total, mainly local residents who had experienced flooding, coastal inundation and gradual submersion, low catch along with other impacts were sensitized or made aware through NADMO after event occurrence coupled with that of Dansoman fishery unions and co-operatives. Other local residents interviewed representing 60% of total respondents said there were no sought of awareness or capacity building programs initiated by the local assembly or any private entity in the area but only heard or were made aware on TV/radio, hence, had accounted to their limited in-depth knowledge on climate change issues.

### **3.3 Self-Protective Measures Initiated by Individual Households in the Study Area**

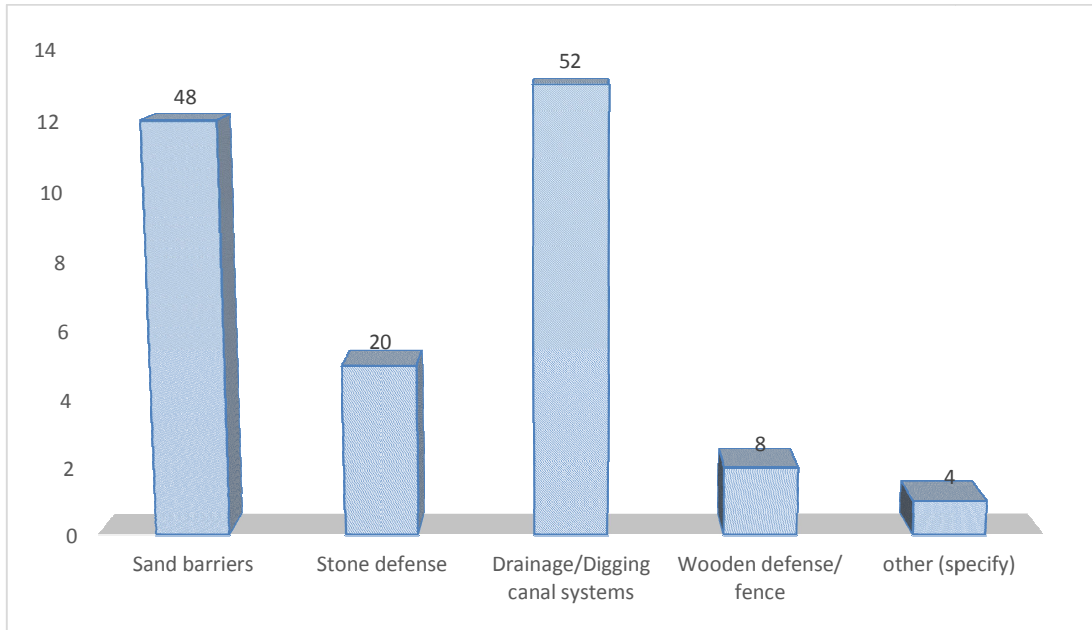
Fig. 1.2 depicts some self-protective measures initiated among some individual households in the study area. The figure illustrated below based on questionnaires administered show, 66% representing 132 respondents out of 200 said they had self-protective measures which temporally help them to adapt to climate hazards. Among such impacts were; flooding after heavy rains among those not in close proximity to the sea, coastal erosion and gradual submersion of land as a result of sea-level rise and high spring tides. 34% representing 68 respondents said they had no self-protective measures against any unforeseen event which may arise from climate change thereby making them highly vulnerable.

Moreover, 66% of respondents who had initiated some adaptive measures in their households had developed canal or drainage systems, sand and stone barriers, wooden or fence defense systems among other mechanisms such as raising of structures above normal levels in a proportion of 26%, 24%, 10%, 2% and 1% respectively as household defense systems against climate hazards.

As highlighted in section 3.3 (Fig. 1.2), the study sought to find out some self-protective measures, initiated by individual households living along the coast of Dansoman and its environs. Findings reveal respondents were further asked how often they spend time, energy and resources to maintain initiated self-protective measures against major climate events in the area. 12.1% representing 16 respondents said they often spend time, energy and resources to maintain the facility, 84.9% representing 112 respondents said they maintain the mechanism once in a while, whereas 3% representing 4 respondents said they don't do anything to maintain it. Most of the respondents attested to the fact that these measures require a lot of funds to develop and increase their adaptive capacity but lacked funds in maintaining it periodically. The reasons for this huge obstacle in terms of maintenance were attributed to:

- ✓ Low earnings
- ✓ High cost of materials for developing these measures
- ✓ Large family sizes with other priorities

- ✓ Economic hardships
- ✓ Uncertainty and change in rainfall patterns



**Fig. 1.2. Self-protective measures initiated by individuals along the coast of Dansoman**

The aforementioned factors highlighted above are major bottlenecks that locals encounter to improve or maintain mitigative measures. This assertion made by respondents were evident in their responses to cost of developing their household self-protective mechanism against climate change events in the area. 27.3% representing 36 respondents said it was very costly to develop such measures, 42.4% representing 56 respondents said it was costly, 30.3% representing 40 respondents said it was not costly to develop such measures.

Results show self-protective measures, initiated by individual households as adaptive climate mechanisms are mainly short-term (reactive) measures. These measures are insufficient in enhancing locals' resilience to large-scale climate events in the area. Increase in magnitude of any already existing climate impact can amplify havoc due to locals' limited capacity to adapt. In a nut-shell, self-protective measures initiated among local residents are short-lived and not robust enough to stand against worst havoocs that may possibly evolve from climate hazards. Moreover, measures initiated by the assembly have only one major intervention, thus, the sea defense mechanism, which is still under extension. Despite the relief to some local households, other residents not benefiting from this intervention are still highly vulnerable. Awareness and capacity building programs, initiated by fishery unions and co-operatives in Dansoman among their members, constituting a section of the entire population still leaves the area susceptible to climate disturbances.

#### 4. DISCUSSION

Results from the study area prove there is no local adaptation policy framework, institutionalized from the National Climate Change Adaptation Strategy (NCCAS). Findings highlight limited initiatives, implemented by the central government through the local assembly and other private entities as outlined in section 3.2 (Table 1.2). The sea defense system, distribution of waste bins, awareness and capacity building programs are fewly initiated mechanisms. The sea defense system was initiated as an emergency long term tool by the central government, through the local assembly to reduce residents' vulnerability to coastal erosion and gradual submersion of land. These impacts emanate

from sea-level rise or high spring tides forcing people to evacuate their homes to resettle in safe zones.

Plates 1, 1.1 and 1.2 show on-going sea defense system under construction and extension leaving some areas along the coast highly vulnerable to sea-level rise which causes inundation or gradual submersion of land. This forcibly affects public and private properties of locals along the coast. Infrastructure and personal properties affected range from houses, agricultural farms, pens for pig farming to state roads. It can be observed from Plates 1.1, 1.2, 1.3 and 1.31 that, the wave action resulting from extreme winds and heavy rains causing high spring tides cause water to splash after hitting the defense wall. This creates a plunge pool or stagnant water behind the defense system. Residents whose households are close to these defence systems attested to the relief this mechanism had given them unlike in previous years. They further stressed that the pool of water created behind the defense system over a period of time causes diseases such as; malaria, cholera, schistosomiasis, onchocerciasis (river blindness) and other worm infections. Increase in the intensity and formation of rainfall patterns in the area as highlighted in Fig. 1.1 cause expansion of these stagnant water behind the defense which further worsens the plight of the people. Disease outbreak formation which is unintended consequences, arising from initiated adaptation strategies by the assembly like that of the sea defence and untimely picking up of trash bins at community centers or zones may be linked to the no-regret strategy concept, which when effectively developed and implemented, should not be an obstacle to development. The strategy has a key principle of not being accompanied by or generate any blight that will serve as a bottleneck in enhancing people's welfare as observed in Plate 1.2.

It was observed that awareness and capacity building programs were only organized through workshops and assembly meetings for various leaderships and fishery union members in the area. These awareness and capacity-building programs are carried out for in digens in limited scope except disaster victims who are being sensitized by NADMO after the occurrence of tragedies. Data gathered clearly states the only major adaptation strategies among coastal communities in Dansoman is the sea defense mechanism and capacity building program organized by fishery unions to fishermen in the area. The study revealed the national sanitation day's goal embraced as an adaptation tool in the area to enhance sanitation had not been fully realized due to poor waste management systems, people's inability to change their lifestyles and poor monitoring and evaluation in the township.

## **5. RECOMMENDATIONS**

The following proposed measures from research findings in the study area can inform decisions and reduce people's vulnerability to climate hazards.

- a. Need for broader participation and consultation across sectors, at all levels among relevant stakeholders to make decision making acceptable and better. Complexities and encompassing nature of some components of the environment always gives room for interdisciplinary approach when developing solutions to tackle environmental problems through diplomacy and so on. Climate change affects a number of sectors hence, developing adaptation strategies needs broader participation/consultation in a holistic manner.
- b. Need for policy frameworks, action plans, programs and projects: Need for PPPPs from both the private (NGOs and international organizations) and public (state) agencies help in creating blueprints in tackling vulnerability issues related to climate hazards or societal blights. These must be backed by investments, commitment and positive political will.
- c. More research or studies in several disciplines and sectors: Climate change impacts on a number of sectors. Among these sectors are climate dependent and highly sensitive sectors like; Agricultural, water and housing, energy among others which are backbones of most countries.
- d. Strengthening of Institutional capacity: Need to support institutions with adequate technical and financial resources to operate efficiently in propelling growth and development in the area.

- e. Behavioral change or change in lifestyles: Often termed as “climate ignorers” there is the need for people to be fully aware of the impacts of climate change, accept the issue at hand and are willing to take the initiative to effect change about their lifestyles. In addition, people with some certain social practices or habits that impacts on the climate negatively can be changed by developing positive lifestyles that do not impact on our climate. Local government and businesses, the media, professional groups and institutions can develop positive will and commitment at all levels to shape our way of life into acceptable ones that could make us achieve our goals in regulating the environment in our quest to attain sustainable development. For instance: use of Chlorofluorocarbons (CFCs) containing products like; deodorants, second-hand freezers, some sun shade creams that people use for swimming as a means to protect themselves from sunburns affects corals which absorbs carbon in the atmosphere by causing them to bleach due to unfavorable growth conditions, Deforestation and so on, increasing population and better standards of living creates room for fancy lifestyles using of more automobiles and airplanes as a means for faster and convenient transportation.

## **6. CONCLUSION**

The study aimed at determining self-protective measures, initiated by the local assembly, private entities and individual households. Results generated shows;

1. There is no formal local climate change adaptation policy framework, institutionalized from the Ghana National Climate Change Policy by Ablekuma West District Assembly for Dansoman and its environs.
2. Most local adaptation strategies initiated in Dansoman are short term reactive measures developed by people after the occurrence of a climate change hazard like; flooding or have the perception of possible floods occurrence during heavy rainy seasons with few long term adaptation measures. These short term measures initiated at the assembly and household levels are costly and ineffective.
3. The two major interventions or adaptation strategies initiated by the local assembly in the area is the sea defense system which is still under construction and extension as well as the national sanitation day which has been fully embraced by locals as an adaptation tool in clearing drainage systems for easy passage of storm water after heavy rains to avoid flooding which is a highly dominant natural phenomenon arising from climate change.
4. Majority of the respondents claimed to have initiated some self-protective measures in their various households as an adaptive tool against floods, coastal inundation and other climate change impacts. Among such measures commonly used in the area are; digging of canal systems, sand barriers, wooden defense/fence as well as raising structures highly above normal levels.

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## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

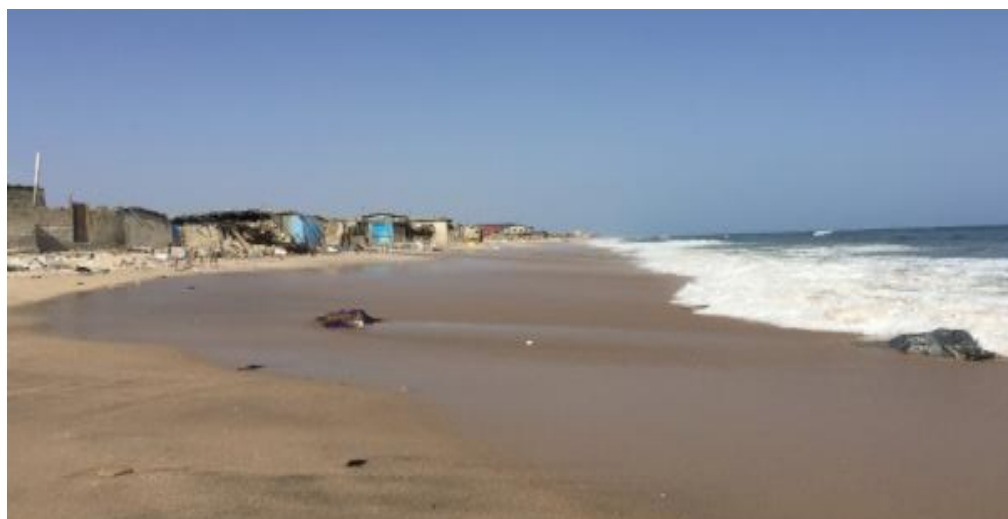
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**APPENDIX I**



**Plate 1.3 and Plate 1.31. Households close to the sea along the coast of Dansoman being affected by coastal inundation**



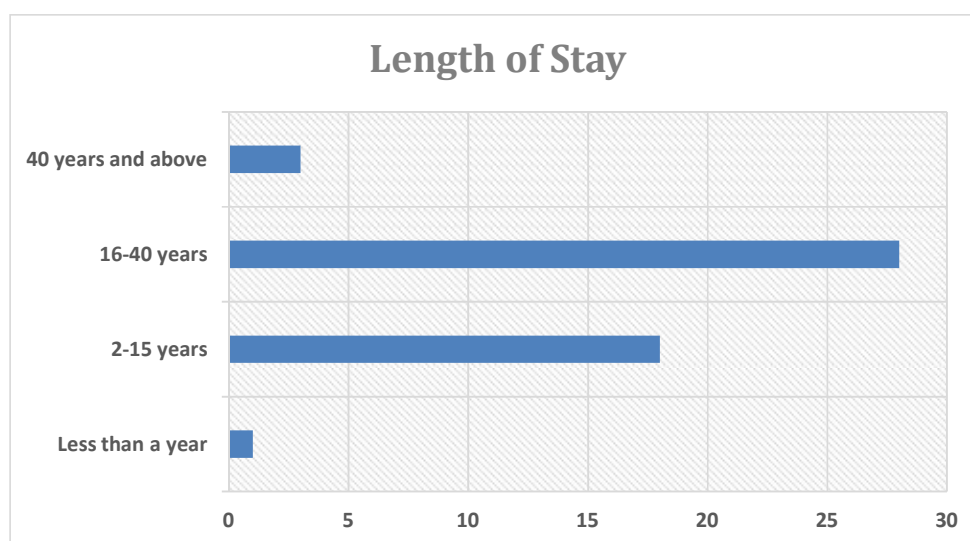
**Plate 1.4. Glefe assembly member in the picture showing how the sea broke down this wall**



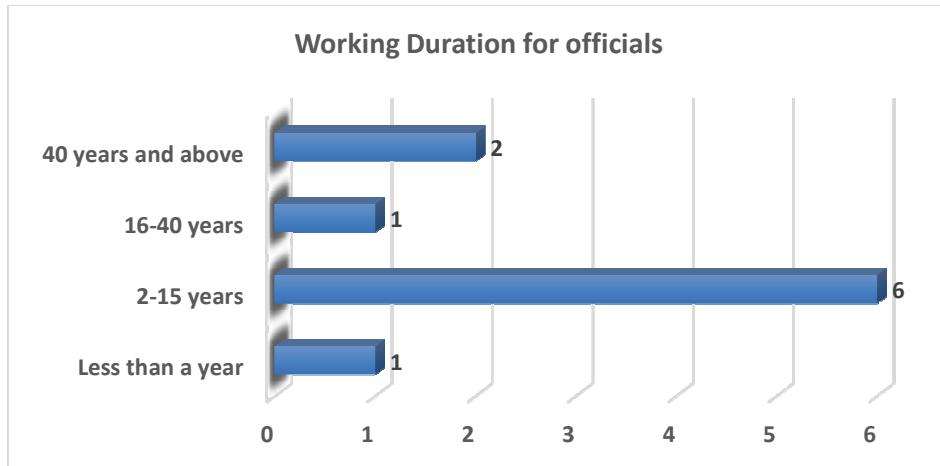
**Plate 1.5.** Image of Chemu lagoon filled with plastic waste close to the coast of Dansoman

**Table 1.3.** Occupational status of respondents

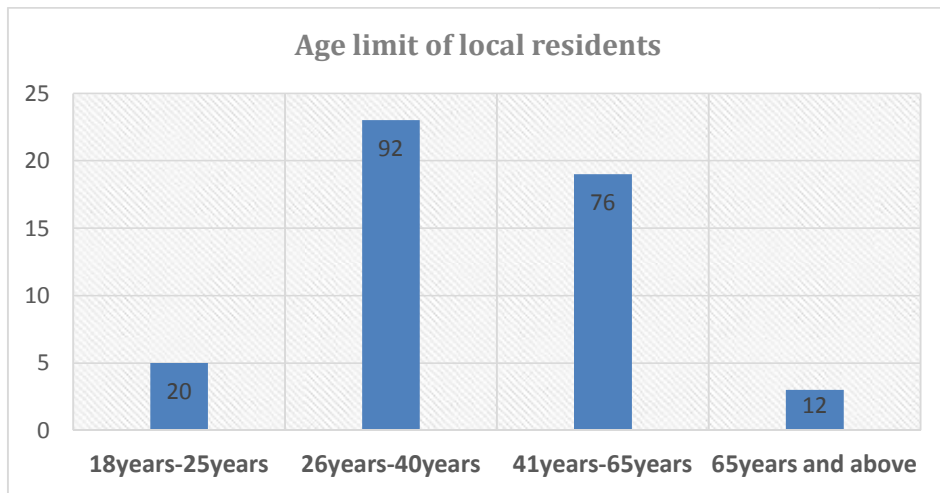
	Frequency	Percentage	Valid percentage
Farmer/Fisher	72	30.0	36.0
Trader	12	5.0	6
Education Staff	24	10	12
Housewife	4	1.7	2
NGO	4	1.7	2
Other (please specify)	84	35.0	42
Total	200	83.3	100.0
Institutional Personnel	10	16.7	
Total	210	100	



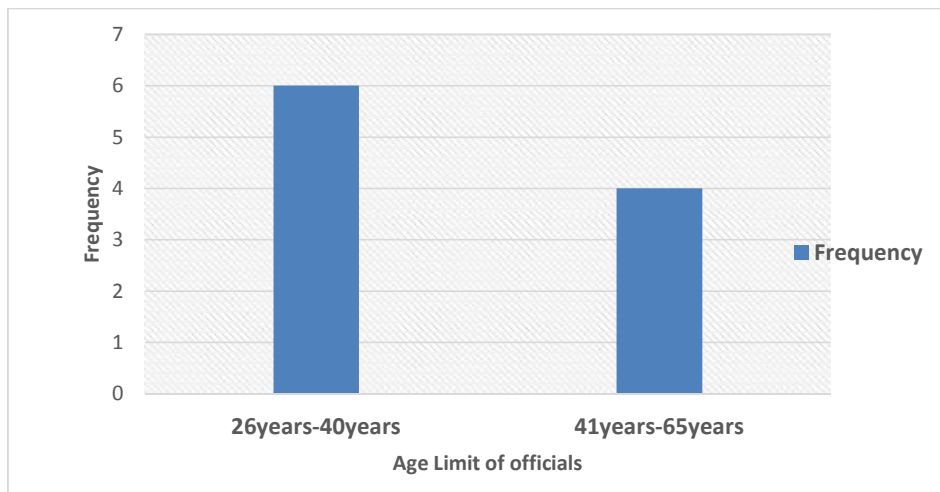
**Fig. 1.3.** Length of stay of local residents in the study area



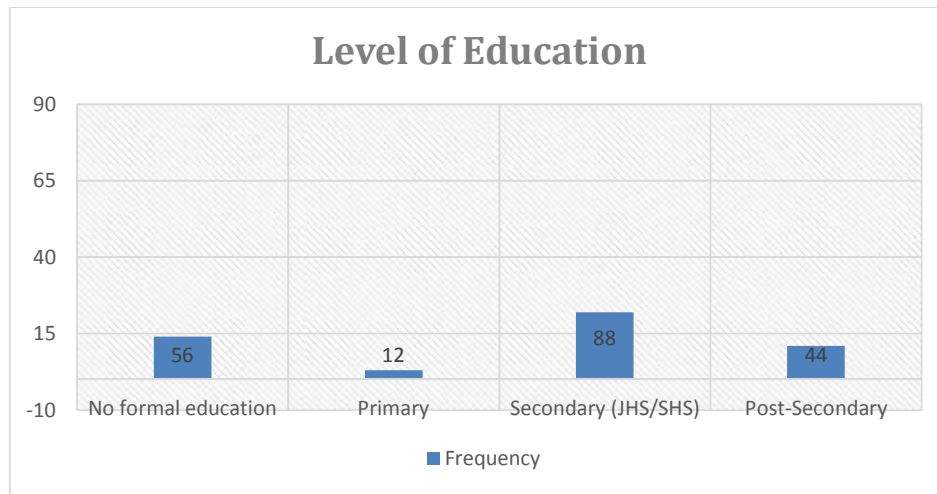
**Fig. 1.4. Duration of work (in years) for institutional personnel**



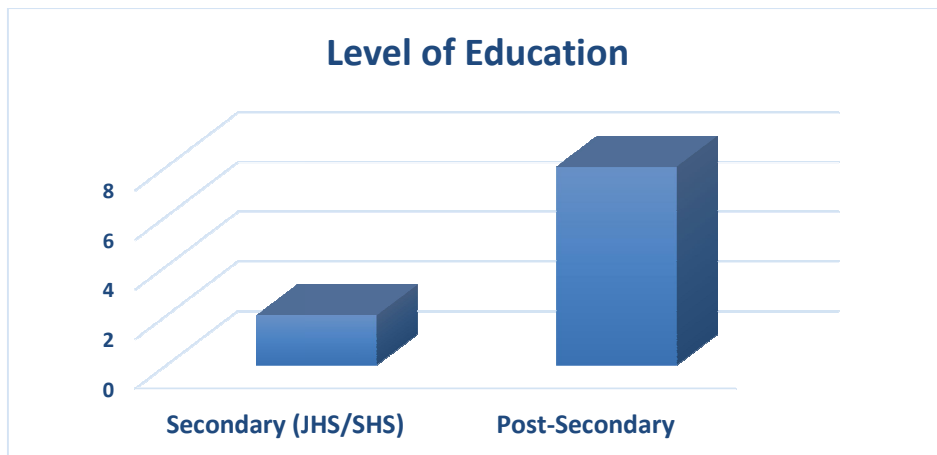
**Fig. 1.5. Age limit of local residents**



**Fig. 1.6. Age limit of officials**



**Fig. 1.7. Educational status of local residents**



**Fig. 1.8. Educational status of institutional personnel**

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He obtained his BSc and MSc degrees in Environment & Development Studies as well as Marine Ecosystem Management & Climate Change in 2014 and 2018 respectively. He currently pursues a Doctor of Philosophy program in History of Meteorological Science and Technology. He serves as a research assistant at the *Research Institute for History of Science & Technology* in the School of Law and Public Affairs, NUIST. He pursues this program in tandem with his role as an environmental co-ordinator at the Institute of Green Growth Solutions (IGGS), Accra-Ghana. He served as a teaching or research assistant at Central University between 2014 and 2017. He nurtures keen interest in imparting knowledge and solving basic problems that stems various communities through scientific research, climate related issues, environmental policy, sustainable development



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