Empowering citizen and community adaptation to systemic risks from climate change

Natural Environment Research Council

EMPOWER Ghana

Case Study Report

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EMPOWER: Empowering citizen and community adaptation to systemic risks from climate change - Ghana Report

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1.0 Introduction

The impacts of climate change on humans are far-reaching and include effects on physical and mental health, environmental devastation, destruction of homes and forced displacement, with the potential breakdown of society. For communities in developing countries, the impacts can be profound on individuals, households and community livelihoods, health and wellbeing. Dependence on the government for implementing adaptation strategies related to individuals, their households and communities (top-down approach) has often not worked for multiple reasons including limited resources and lack of priority for climate change adaptation.

In light of this, there is the need to build individual adaptation capacities (bottom-up approach) so people can take control of their own adaptation, to ease the impact of climate change on them, their households and communities. The EMPOWER project was designed to support the bottom-up adaptation approach through two workshops implemented in the Lower Volta Basin in Ghana. The first workshop titled, "participatory mapping of climate threats and initial adaptation options," was mainly used to identify climate threats that directly or indirectly impact on the health, well-being and livelihoods of individuals, their families, and communities in the Lower Volta Basin. It was also used to preliminarily identify interventions used by the individuals, their households and communities for adaptation to the identified climate threats. As a follow-up to workshop 1, a second workshop titled, "review interventions and personal adaptation planning", was organised to validate the threats and adaptation interventions identified by participants who attended workshop 1. It also provided an opportunity for participants to outline additional adaptation measures being used, discuss the practical application of the measures, and brainstorm on emerging barriers and trade-offs.

2.0 Methodology

The methodology consisted mainly of analysis of data collected from inhabitants of the Lower Volta region via two rounds of workshop meetings. The workshop meetings resulted in co-development of a participatory system map of climate threats and adaptation interventions already in use as well as those planned for future use. The participants of the workshop were drawn from 24 communities located in the upstream and downstream areas of the Lower Volta Region (Table 1) and had a good gender balance (nearly 50% representation from each gender).

2.1 Workshop 1

Workshop 1 engaged 24 participants drawn from a pool of different livelihood sectors in the Lower Volta Basin. The list of participants included occupations from fishing, farming, government, business and teaching. The workshop started with a general introduction to the EMPOWER project, brief reflection on some climate threats in the Lower Volta Basin, and guidance on the workshop process. Following that, participants were put into three groups of 8 persons, to answer specific questions in 2 breakout sessions, each group was led by a 3-member facilitation team (facilitator, note taker and translator) and was composed of participants from different occupations, gender, and geography. At breakout session 1, participants were introduced to the primary factor (i.e., health, wellbeing, and livelihood of me, my household, and community) and supporting factors (e.g., food accessibility and nutrition, such as drought or flood) that relates to them and might be impacted on by climate threats and were asked to add on to the supporting factors if they had any. Thereafter, the facilitation teams worked with the participants in a participatory manner to identify various climate threats/risks that directly or indirectly (via supporting factors) affected their livelihoods and wellbeing, using cards, sticky notes, markers, etc. The groups identified various threats that were consolidated in a plenary session into 13 threats for the Lower Volta Basin. In the second break-out session, participants worked with the facilitation teams to link the consolidated threats to the supporting/primary factor and gave provisional interventions they use for adapting to the climate threats. After the workshop, the Ghana project team merged the outputs from the 3 groups and constructed the merged output using the Participatory System Mapper (PRSM). PRSM allowed for complete visualisation of the links between the supporting factors, climate threats and intervention strategies

2.2 Workshop 2

Workshop 2 was undertaken on the 9th February 2022, with 22 participants out of the 24 from workshop1. Participants were shown the final version of the participatory systems map, which was developed based on findings from workshop 1. It highlighted the primary and supporting factors, climate threats identified by the participants, and demonstrated how the participants mapped the factors, threats, and interventions. Participants were asked to validate the map with their suggestions during workshop 1. A presentation was also made to practically demonstrate individual and household climate threats and adaptation options being used globally and in the African setting to be specific. This afforded the participants a global understanding of the similarities and differences in approaches being adopted by individuals to mitigate climate

threats. The participants were grouped into two groups of twelve (12) each. The breakout groups were categorised into upstream and downstream communities along the lower basin of the Volta river. This was to understand how the interventions were being practically implemented, given their different contexts and climatic experiences. The open forum at breakout, discussed feasibility of the interventions, in terms of cost, technical knowledge/expertise, material availability, social acceptance (negative feedback arising from adaptation measures) and trade-offs (loss/gains) for implementing each of the interventions. These were populated in two spreadsheets for each community. At plenary, due to time constraints, a summary from each group was given briefly. Participants were also queried on their use of specific interventions, applicability to their household and the possibility of using an intervention in the future.

2.3 Participant Evaluation

For both workshops, with participants consent, each person filled in an evaluation form, answering questions based on their knowledge about climate change, expectations from the workshops, the benefits of interventions used among others.

3.0 Results

The primary factor for the workshop was, on livelihood, health and wellbeing of me, my household and my community. Eight supporting factors influenced this primary factor, including, food and water, stable financial income, housing conditions, workplace conditions, mobility, energy, social connections and mental health. From the primary and secondary factors, participants from the three breakout groups in the first workshop outlined thirteen (13) climate threats and risks which affected the supporting factors. The climate threats included; high temperature, flooding, tidal waves, coastal erosion, heavy rains, drought, unpredictable/erratic rainfall, bushfire, sea level rise, high/low wind, cold sea breeze chills, salt water intrusion and alien invasive species (Table 1).

Table 1: Climate threats affecting communities of the Lower Volta Region.

Downstream communities (Ada east, anloga, sokpoe, agave, ada foah, Ave-Seva, Akatsi North, Tosukpo, Fuveme, Ave-Dakpa, Sikor, Bleamezado, Dikato, Agorbledokoe)	**Upstream communities** (Agbetikpo,dove, volo, Mafi-Tsakpo, Ayiwata , Awadiwoe)
Bush fires	Bush fires
High/low winds	High/low winds
Drought	Drought
Erratic (unpredictable) rainfall	Erratic (unpredictable) rainfall
High temperature	High temperature
Heavy rainfall	Heavy rainfall
Cold sea breeze	Cold sea breeze
Invasion of alien species	Invasion of alien species
Flooding	Flooding
Coastal erosion	
Sea level rise	
Tidal waves	
Saltwater intrusion	

3.1 Key Highlights

3.1.1 Workshop 1: Participatory Systems Mapping

Figure 1 shows the Participatory Systems Map of the climate threats and interventions, linking to the supporting factors. The linkages are a merger of the three breakout groups. A higher density of threats were linked to food and water security, and housing and workplace conditions. Participants also outlined 24 adaptation measures or interventions they usually employ in the face of the climate threats. For instance, irrigation methods are used to combat drought episodes, which influence food and water security. During heavy rains and cold episodes from sea breeze, the individuals use warm clothing and also consume special herbal concoctions to keep warm. Invasion of alien species was a critical concern for participants, as these weeds cover the surface of the Volta river, deltas and estuaries, making fishing near-

impossible, which ultimately altered their livelihoods. Individuals stated that these species were introduced into the region from recent climate change events. The intervention used was to remove the weeds, individually or as a community. To tackle the issues of coastal and riverine flooding at the Volta, individuals heap a mixture of weeds, charcoal debris and sandbags, to block flooding from the sea. In addition, gullies are created around homes to channel the floodwaters without penetrating into the houses.

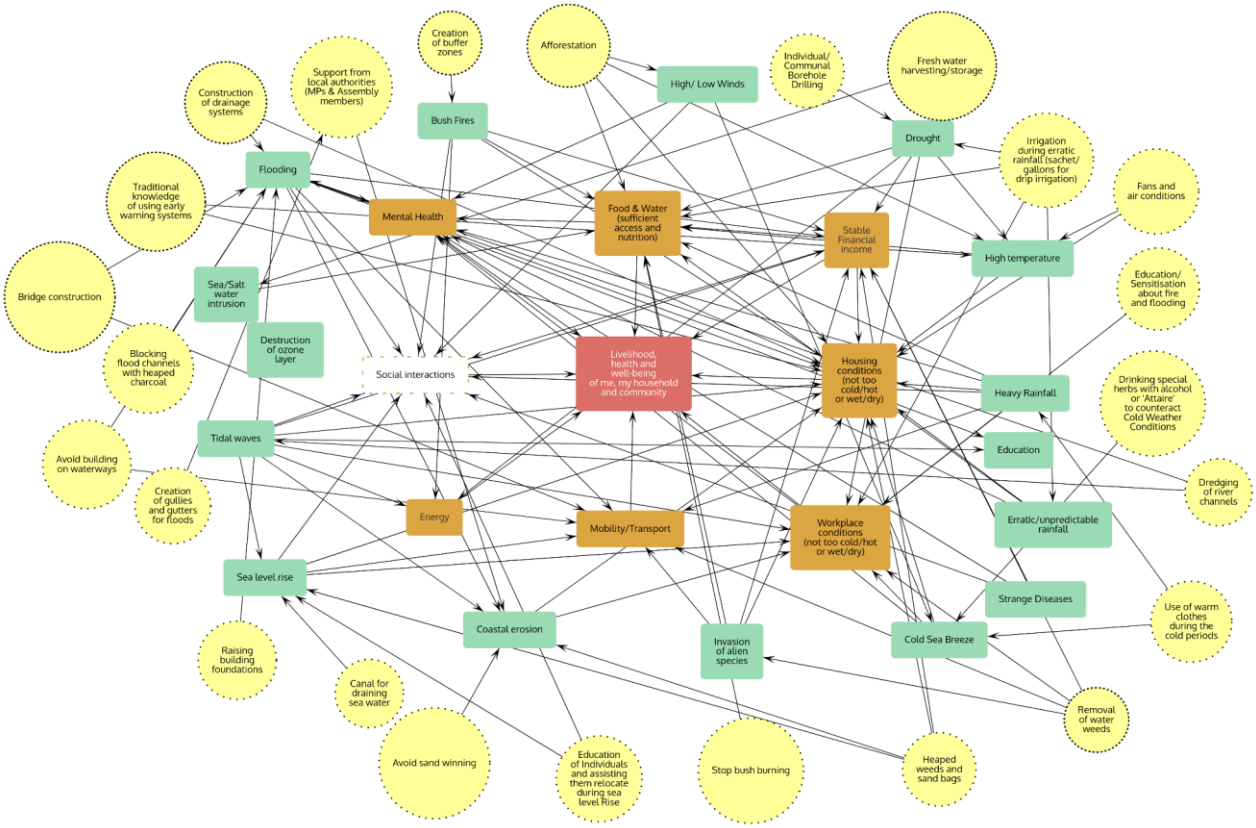


Figure 1: Participatory systems mapping of the climate threats to supporting factors and interventions. Red box is the primary factor, brown boxes represent the supporting factors, climate threats/risks are shown in green boxes, with yellow circles denoting the interventions.

3.1.2 Workshop 2: Adaptation measures for Upstream/Downstream Communities

As stated previously, under workshop 2, participants delved deeper into their interventions, elaborating on the feasibility and trade-offs in their implementations. Therefore, in this section, all interventions are discussed separately as per the discussions from the two groups. Some interventions only affected communities downstream of the Volta dam, and are denoted with an asterisk (*).

Bushfire: Buffer zones are created to reduce bushfire occurrences. Individually, this method is moderately expensive, especially for the hiring of labour. However, its implementation using the community labour approach makes it less expensive. Materials such as palm fronds, sand and cassava barriers, and tools such as cutlasses and hoes, are available within the local area and can be purchased for use. No specialised prior technical knowledge is needed for the creation of the buffer zones. But it is crucial to know the direction of wind and the timing for burning around the buffer, to ensure neighbouring farms are not destroyed. The method is generally socially acceptable, but with losses in time. Debris from the buffer creation can be used as mulch and charcoal.

High/Low winds: Afforestation is undertaken at the individual and household scale, where trees like neem, coconut, mango, acacia, teak and mahogany are planted at the compounds of homes. The method is time-consuming and expensive as seedlings for these trees have to be purchased, and nursed. Local knowledge is needed, with additional help from agricultural extension officers on best horticultural practices. Seedlings and planting materials are not readily available. At successful maturity of these trees, they can serve as shade, provide medicinal value (neem), and serve as a source of food (coconut, mango), but can also weaken buildings as their roots penetrate horizontally. Afforestation is acceptable by the people as a desirable activity since it benefits the whole community.

Drought/Erratic (unpredictable) rainfall: Irrigation strategies supplement the rain-fed agriculture during the dry season or low rainfall periods. This mechanism is very expensive and only few farmers can afford it due to the high cost of hiring pumps, fuel and equipment maintenance. In addition, it is time-consuming and tedious when using alternative means like buckets and gallons for irrigation. Approximately, 5 drums of water are needed to irrigate a 12x 12 yard farmland. Technical expertise is needed from extension officers on soil properties, crop types and irrigation scheduling. Irrigation materials are readily available on the market. The method is not always acceptable, as irrigation using sprinklers creates channels, which causes erosion. Erosion affects nearby roads and floods compounds of neighbouring households. Also, the use of community water sources for irrigation affects water availability for other users who complain about its use during the dry season. Some hired irrigators, walk-through farms, which intentionally or unintentionally destroy crops. Others also create

pathways to have easy access to irrigate farms and crops. Finally, the fertigation method pollutes neighbouring water bodies, enhancing eutrophication and algal bloom.

High temperature: Fans are cheap, readily available and used to combat hot days arising from high temperature. But this can be energy consuming, raising the electricity tariffs at the household scale. Skills are needed in the installation of the fans, along with knowledge in energy consumption, to select the right type of fan for use at home. Fans are socially acceptable, except when they are faulty and noisy enough to disturb and distract neighbours. The use of fans also improves family relationships, builds social connections and improves household health and individual prestige. Additionally, windows can be opened to reduce heat in rooms.

Heavy rainfall: During heavy rainfall events, warm clothes are used. These clothes can be low to highly expensive depending on the season in which they are purchased. No special skill is needed, preference of clothes such as jackets, pullovers, rain-coats, depends on the individual. The materials are readily available at the local markets.

Cold sea breeze: For cold wind chill from sea breeze, individuals consume locally, inexpensive brewed gin ("akpeteshie"), or "attire" to keep warm. This is socially acceptable, except when recommended amounts are exceeded. There are locals who are experienced in brewing these gins and concoctions for purchase by individuals. The materials include, sugarcane, sugar, palm wine, water, drums and firewood, which are all readily available. One disadvantage of this intervention is the potential to increase drunkenness and addiction in consumers, leading to undesirable consequences. Thus, women become more vulnerable to abuse, men lose their jobs, family and community respect, and are also unable to make any monetary savings.

Invasion of alien species: Alien species (weeds) are removed with ropes, rakes, cutlasses, sticks, canoes, wheelbarrows, gloves, bamboos and labour. It is an expensive method in terms of time consumed and hiring of labour. The cost of labour can range from 50 to 700 Ghana cedis. The method is socially acceptable, but improper disposal of the weeds can block pathways of minor rivers and streams. Foul stench from rotten weeds is also not desirable. Fisherfolks who usually remove these weeds are required to have swimming skills. Interestingly, these alien weeds have a significant trade-off in medicinal value (example the

water lily, which is used to treat body inflammation). They can be used for fertilizer, animal feed, and when combined with sand, they can sparkle clean utensils.

Flooding: To counteract flooding, sandbags and debris from charcoal are used to raise river banks and create artificial blockages to water intrusion. Filling of sandbags is expensive to individuals, in terms of the cost of sacks, labour for bagging and transportation of the sand. It is also very expensive when using machines to raise riverbanks. The materials for sandbagging are, however, readily available. No special skills are required, but individuals must ensure that sandbags are placed across and not along the flow path of the water. Additionally, participants stated that this strategy is acceptable, except when water is diverted to neighbouring houses and farmlands. As a trade-off, this activity leads to loss of money, time and energy, and land degradation, but buildings are protected in the long term.

Coastal erosion*: Avoidance of sandwinning is the adaptation measure. It is moderately expensive. At the community scale, community action has foreseen some individuals playing key roles in stopping sandwinning by either employing state security or serving as local security themselves. Spears, cutlasses, sticks, communal vigilantism and state security forces are the materials and manpower used. These means of ensuring sandwinning is avoided, are all acceptable by the community, due to the impact of the erosion they face constantly on their livelihood. No special skills are needed to avoid sandwinning. But this strategy costs the community severely, as money used could have been channelled towards community development.

Sea level rise and tidal waves*: Individuals in communities are evacuated and relocated to higher grounds, and sometimes canals are created to drain seawater. This can be moderately expensive (canals) to expensive (evacuation). No expertise is required, materials like shovels and hoes for canal creations are readily available and socially accepted. However, this strategy is considered to be time, money and energy consuming.

Saltwater intrusion*: Freshwater is usually harvested and stored for future use. This mechanism can be expensive due to the cost of storage material (drums, gallons, barrels, tanks, concrete blocks), which are readily available on the market. The method is socially acceptable but time-consuming and results in a loss of money. Masonry expertise is required for the laying of concrete blocks for storage materials. For the use of plastic drums and barrels, no skills are

needed. The stored water is treated using alum as a flocculant to remove unwanted colour and turbidity in water, making it suitable for domestic use.

3.1.2.1 Participants adaptation statistics

Figure 2 shows the participants responses to the various interventions in terms of whether these interventions are actively being used or already existed. In case of non-applicability of an intervention, respondents were asked to indicate the possibility of implementing these in the future. Figure 2 is therefore the sum of all responses linked to all the supporting factors. For all seven supporting factors, a total of 118 responses stated that the corresponding interventions were already being implemented and were their own initiatives. In addition, 24 responses linked the implemented interventions to already existing methods, whereas 19 were from community initiatives. For most supporting factors, a total of 6 respondents planned to undertake the adaptation strategy in the next 3 months, 12 in the next 6 months, and 39 would implement them in the course of the year or more. The likelihood of most implementations in the next 6 to 12 months were linked to financial constraints. For those who do not plan to use the interventions, in the future, most interventions were not applicable in their communities (37), 17 responses needed financial support and 18 do not have ownership rights.

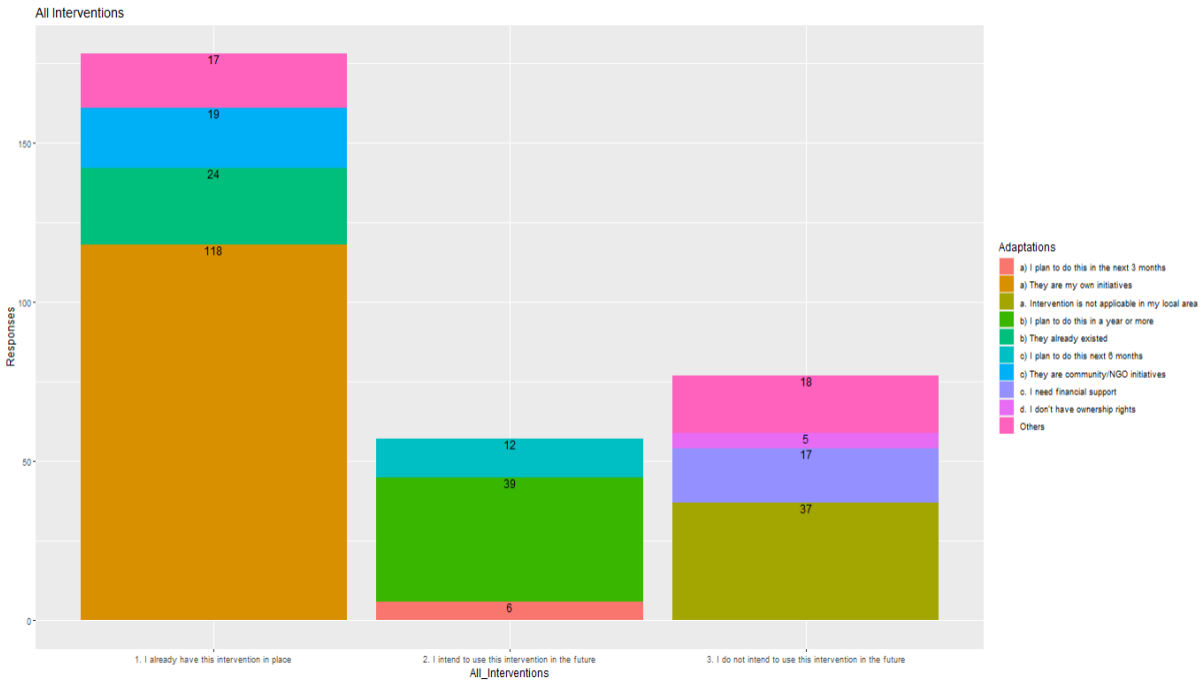


Figure 2: Responses to use of adaptation measures pertaining to the supporting factors.

In Figure 3, participants gave responses to the climate threats of agricultural drought, bush fires and sea/salt water intrusion on food and water security, with the interventions of irrigation, buffer zone creation and freshwater harvesting respectively. For the three interventions, a total of 32 responses were obtained for the interventions already in place. Twenty-two of the responses showed that the interventions were individual initiatives, whereas 5 already existed and also were of community initiatives. Few participants intend to use the various interventions in the future. But the number of responses whereby participants did not intend to use any of the three interventions on food and water was relatively high. This was mainly because the interventions were not applicable to their location.

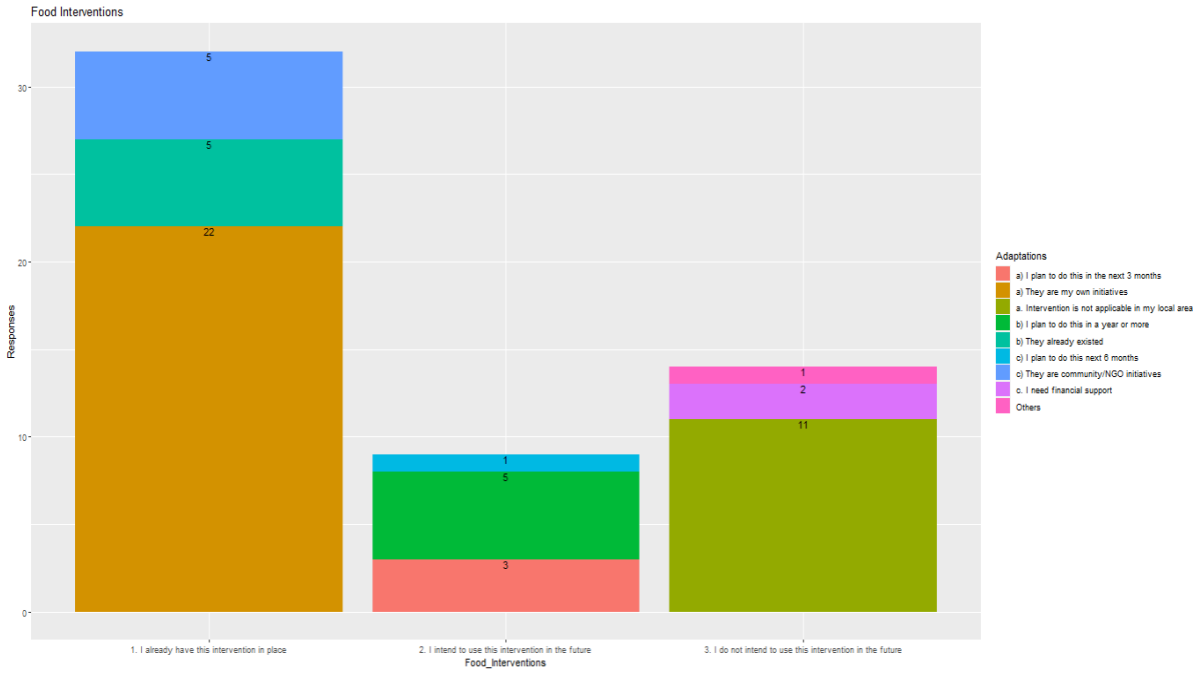


Figure 3: Responses to interventions pertaining to food and water security.

Under housing conditions as a supporting factor, participants were asked about their use of fans and air conditioning, afforestation and raising of building foundations to counteract high temperature, damaging strong winds and flooding of houses respectively. The responses showed that these interventions were in place and also borne out of individual's own initiatives (20), with three responses indicating that they already existed (Figure 4). Seven (7) of the responses indicated respondents plan to undertake the interventions in the next 6 to 12 months, whereas 4 participants indicated that these interventions were not applicable to their locations.

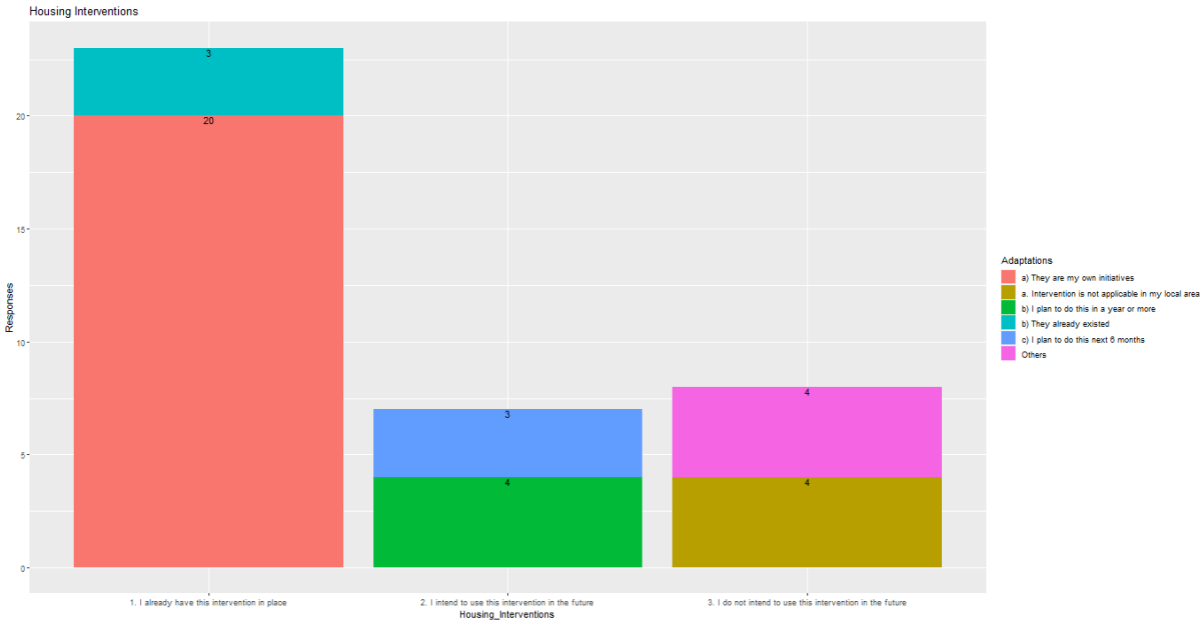


Figure 4: Responses to interventions pertaining to housing conditions.

From Figure 5, participants responded to questions on the likelihood of using alternative energy sources like solar as an intervention to irregular power supply and changing from wood to metal/concrete poles to cater for burning of electric poles which affect power supply. Eight responses showed that participants already had solar as an alternative measure, along with replacing wooden electric poles with concrete and metallic poles. However, others mentioned the use of generators instead of solar panels as an alternative energy source. Most participants who intend to use solar as an alternative means of energy in the next 3 to 12 months (16) also require financial support (9). On the other hand, those who do not have ownership rights (3), are participants who do not have ownership rights to the installation or changing of wooden electric poles to metallic or concrete.

The mental health of an individual is crucial to their overall well-being. Financial insecurity due to loss of farm produce in heavy rainfall seasons and cold weather affect the mental state of individuals. In the case of loss of farm produce, seasonal weather forecasts can be relied on prior to the planting season. Participants during workshop 1 and 2 also noted that drinking of special herbs “attire” and warm clothing can counteract cold weather days. Figure 6 therefore shows the total number of participants who implemented these interventions to help improve their mental health. Twenty responses showed that the interventions were already in place, with 11 showing them already existing. For the future intention of the use of the interventions, there were 2 responses, which are linked to the possibility of using seasonal forecasts before the

planting season. Moreover, a high number of "others" (10) is observed for no intention to use these interventions in the future. It should be noted that this number pertained solely to the use of "attire" as a measure against cold weather, with which most people stated they do not drink due to personal reasons.

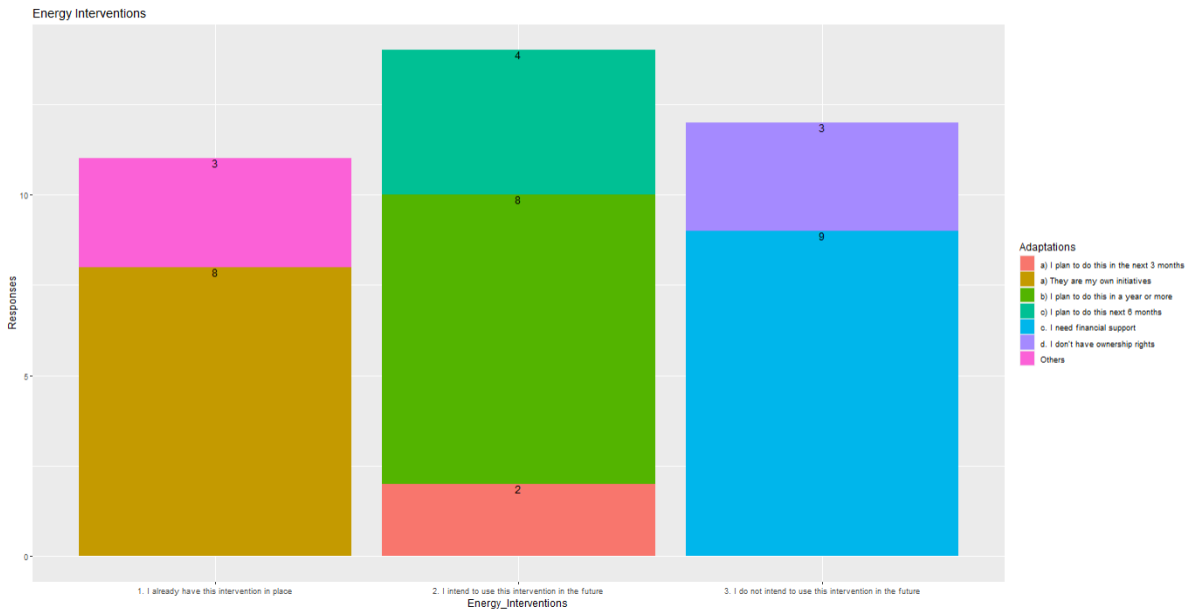


Figure 5: Responses to interventions pertaining to energy.

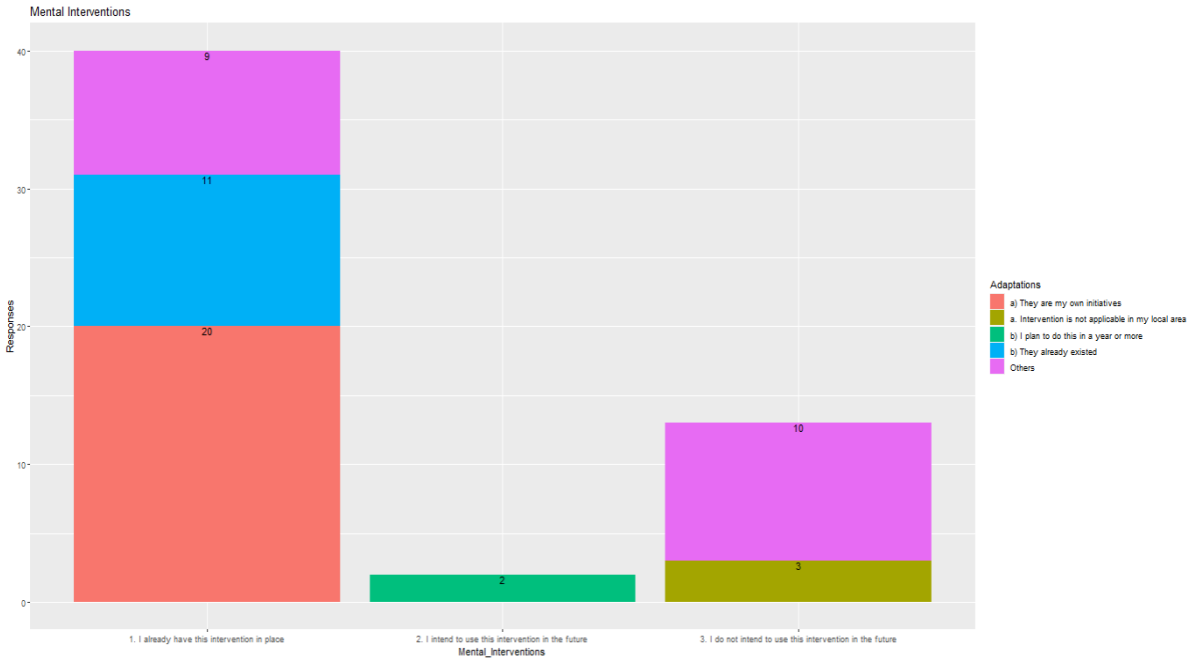


Figure 6: Responses to interventions pertaining to mental health.

The lower Volta communities are plagued with alien species invasion, coastal flooding and water overflow on roads which impede mobility and transport. To curtail these problems, individuals and communities have sought to remove the alien species (weeds) which are on water surfaces, sandbags and creation of gutters for coastal flooding and water overflow on roads respectively. Responses in Figure 7 show that these interventions were either individual initiatives (21) or community/NGO initiatives (10). Interventions such as coastal flooding are not applicable to participants living in upstream communities (see Table 1), and this raised the responses to about 16 under the "I do not plan to use this intervention in the future" option.

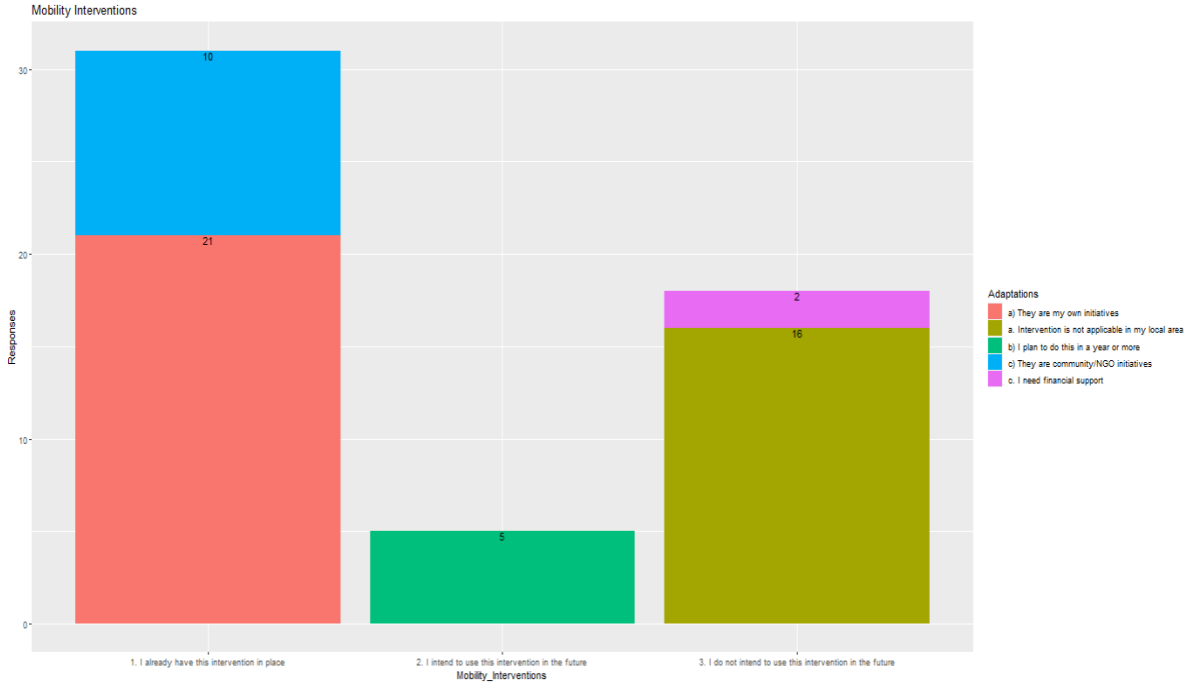


Figure 7: Responses to interventions pertaining to mobility and transport.

Figure 8 shows the total responses for the stability of financial income when participants' livelihoods are affected by bushfires, prolonged dry spells and flooding at their workplaces. Some interventions given respectively for the threat included securing insurance, use of weather forecasts and the use of emergency flood kits. For all three interventions, 13 responses showed they were actively being used, with these being individual initiatives. Fourteen responses showed plans to implement these strategies within the year, which is skewed towards securing insurance for farms and the use of weather forecasts. Here also, financial support is a limiting factor for the implementation of adaptation strategies, such as the securing of insurance

and purchasing of emergency flood kits. Some respondents also made it known that they use emergency kits to access their farms during heavy rainfall periods leading to floods.

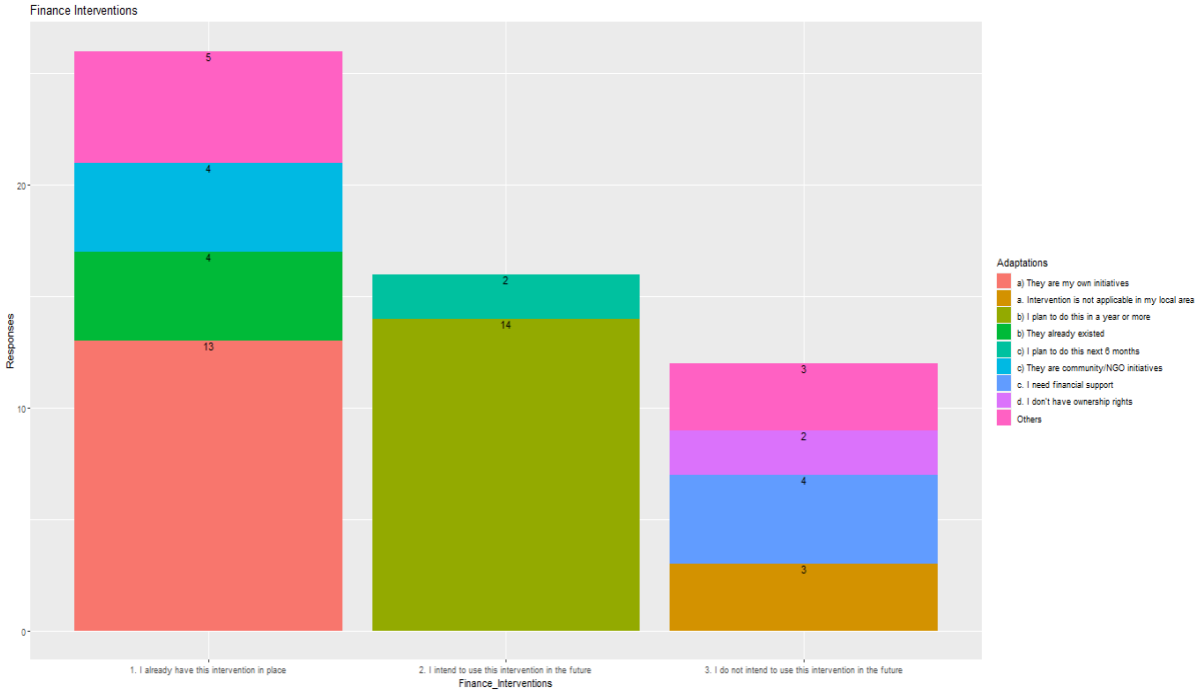


Figure 8: Responses to interventions pertaining to financial stability.

3.2 Evaluation of workshop

3.2.1 Evaluation of Workshop 1

From Figure 9a, about 46% of the participants strongly agreed and 17% agreed that they were aware of the impacts of climate change. This showed that, although few participants had some level of awareness of climate change threats, their level of awareness of the effects of climate change to themselves and families was generally below average. Again, 25% of the participants strongly disagreed, while 13% disagreed that they were aware of the impacts of climate change. These groups constituted the least who were not aware of the threats climate posed to themselves and their families. The workshop was thus useful to the participants, as it empowered and enabled them to identify their climate risk factors and co-develop adaptation measures to mitigate such threats in the long term. From Figure 10b, about 24% of the participants strongly disagreed and 16% disagreed respectively that they have prepared plans to mitigate the effects of climate change. This compares with a second cohort which strongly

agreed (40%) and those who agreed (21%) that they were well-prepared in terms of concrete plans and actions to reduce the effects of climate risk should such events occur.

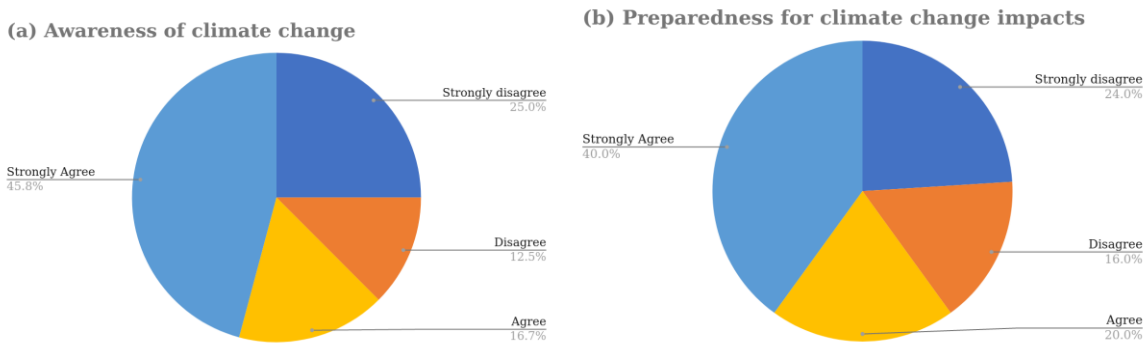


Figure 9: Sample evaluation outcomes from workshop 1 based on participants' feedback.

In addition, the average response on the usefulness of the methodology in workshop 1 was 82% (Table 2). This shows that the group dynamics and the participatory system mapping played a highly useful role in contributing towards participants' understanding and the success of the workshop. A little above half (55%) of the respondents perceived that the shared experiences and practices were useful. In addition, almost two thirds (63%) confirmed that the recommendations made were useful for their work. The participants perceived the workshop materials, including the slides with case studies which were distributed to them, as very useful and handy reference materials. The participants rated their understanding of new approaches/techniques and concepts at 70%, an indication that the facilitators were able to clearly communicate and convey to their understanding the terms and concepts used in the workshop. Most of the participants (81%) indicated the workshop had improved upon their knowledge on climate risk factors, how they impact on their livelihoods and adaptation measures in order to reduce such risks.

Table 2: Relevance and impact of the workshop

Statement	Highly useful		Useful		Adequate		Total	
	Freq	%	Freq	%	Freq	%	Freq	%
Usefulness of methodology for your work	18	82	4	18	0	0	22	100
Usefulness of shared experiences and practices	9	41	12	55	1	4.5	22	100
Relevance of the recommendations for your work	8	33	15	63	1	4	24	100
Approaches/techniques/concepts	16	70	13	35	4	17	23	100
Strengthened Knowledge on climate	17	81	4	19	0	0	21	100

3.2.2 Evaluation of Workshop 2

Participants responded to questions such as in (a) the cost-effectiveness of climate adaptation actions currently being used, (b) likelihood of using fire extinguisher as a measure for adapting to wildfires arising from climate change, (c) likelihood of purchasing emergency flood kits for household use in the event of flooding and other climate related emergencies and (d) likelihood of using a weather forecast technology for predicting events of the climates in the future (Figure 10).

From Figure 10a, most participants indicated that their adaptation plans were very effective (52.2%), with 17.4% and 13% observing extremely effective and very ineffective respectively. The use of fire extinguishers, not only denotes the carbon filled extinguishers, but other means for which wildfires are put out. This could be the dumping of sand, water, among others on raging fires. For the extinguishing of fires, the majority are neutral (28.6%) on the likelihood of using fire extinguishers. This may be a possible misinterpretation by participants of the "fire extinguisher" indicated in the question. However, 28.6% stated that they are very likely to use fire extinguishing methods in the face of wild and bush fires. The possible mechanism being the creation of buffer zones as listed in their interventions. 37.5% found it unlikely they would be purchasing emergency flood kits in the occurrence of floods. This may be due to the monetary constraints and possibly the high cost of purchase of these kits. There have been efforts by the Ghana Meteorological Agency to improve weather forecast dissemination to farmers and fisherfolks daily. Unfortunately, participants were not asked if such information

reaches them daily before they undertake the day's work. Therefore, the majority response on the use of weather technology was divided between likely and unlikely (37.5%) each.

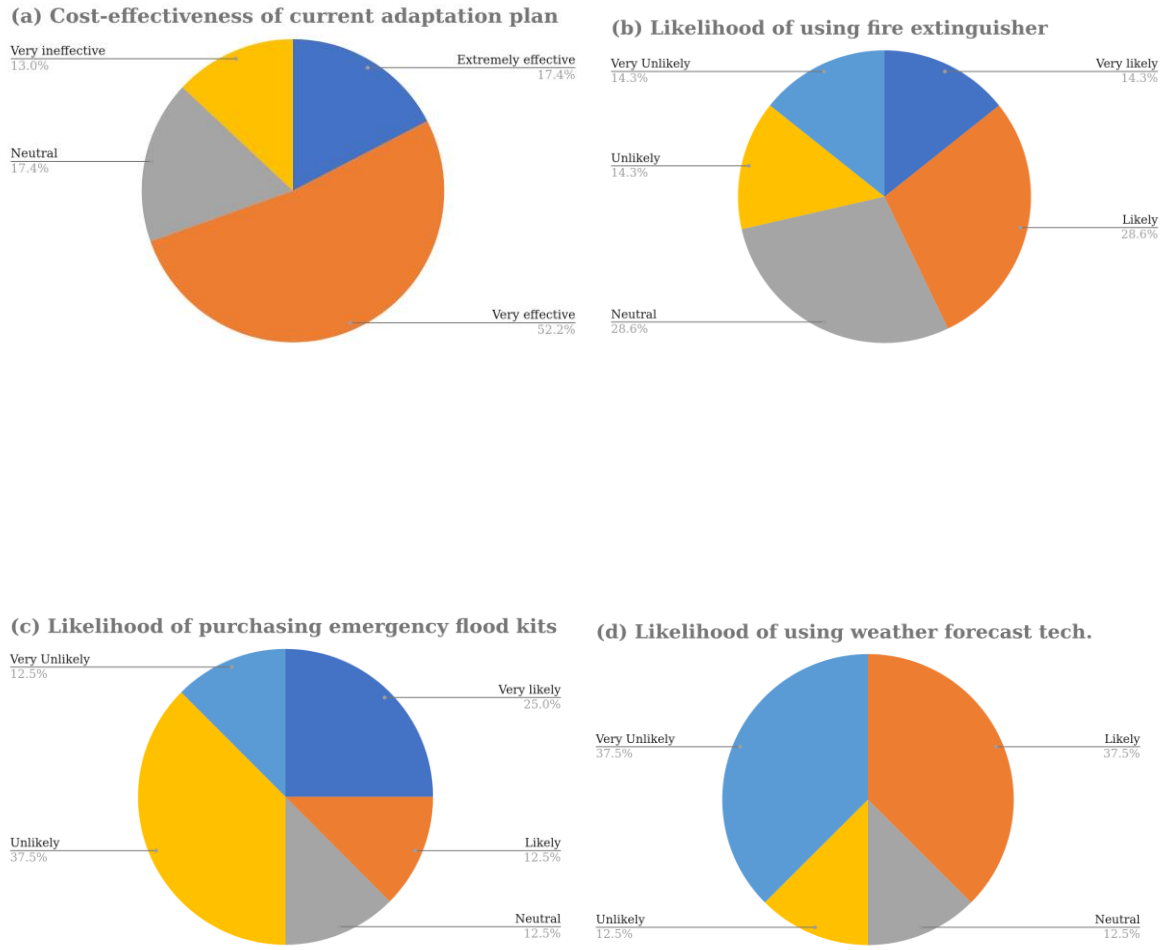


Figure 10: Sample evaluation outcomes from workshop two based on participants' feedback.

4.0 Lessons Learnt

4.1 Facilitators

In general, both workshops were successful and insightful. It appears that the critical success factors of the workshop include the methodology used, which was a combination of presentations and breakout group discussions. Participants found the concepts, and strategies used as relevant and would thus most likely apply knowledge acquired in their contexts. The structure, content and materials used were considered to be relevant for the workshop. It was

interesting to note the various adaptation plans being used at the local scale by the individuals, households and communities to ensure sustainability of their livelihood, health and wellbeing. The selection criteria used resulted in the selection of participants from across different communities and sectors, which increased diverse opinions on climate change adaptation issues. The participants liked the bottom-up approach used in the workshop as compared to the often top-down approach, where climate decisions are often made by state officials. The bottom-up approach contributed towards the creation of an open, positive and participatory environment which enabled knowledge and experience sharing among the participants.

The use of participatory systems mapping was also mentioned as an important success factor. The participants considered the participatory approach as useful as they individually contributed towards discussions about the identification of climate threats and adaptation measures suitable to their local context and realities. The technical facilitators had experience in the subject areas of the workshop. Their combination and complementarity were underlined as relevant in the delivery of the workshop. However, participants noted that the facilitators should try to increase the time for presentations, group discussions and reporting. Many suggestions or recommendations were given by participants at the end of the workshops. The most prominent, touching on annual workshops to better train individual communities on climate change and adaptation. In fact, participants are keen on learning better ways to improve their climate interventions that can be less costly and time-consuming, but sustainable in the long-term.

4.2 Participants

With the vibrant engagements in workshops, 1&2, participants also were eager to share their experiences. They noted that, in every situation, there are measures and adaptations, and hence adaptation strategies must be taken swiftly before calling on government officials. Disaster from climate change is bound to happen and one should be ready to adopt preventive and corrective measures. The individual, family and community should put in place adaptation measures to either avoid or prepare to mitigate the negative consequences of climate threats. They also became more informed on how other people are adapting to climate change in the UK and India, and their applicability to their communities. Last but not least, they gained knowledge about climate change, the causes, effects and possible interventions, and feasibility.

4.3 Challenges

There were very few challenges noted during the workshop. For instance, internet connectivity was sometimes erratic, making it difficult to live-stream some group discussions. The timing of both first and second workshops were great, but in future, and with a longer time-span for the project, these can be done in both the dry and wet monsoon seasons. This would enable us to capture holistically the effectiveness of the intervention plans. But in the short-term, although the project is ending, the WhatsApp group created could be used to gather such data. In addition, there was no time for facilitators to visit the communities and engage them prior to both workshops. Participants reporting time at the first workshop was quite late, but this improved in the second workshop. Movement between three breakout venues, and regrouping of participants for plenary discussions, also delayed proceedings considerably in the first workshop. Furthermore, during the second workshop, facilitators under-estimated the time required for the break-out group in-depth discussions on their interventions. This led to almost a two hour over-estimation of the time to adjourn the workshop. Therefore, at plenary, the two groups reporting had to be minimised and some presentations completely shortened. The keenness and interest of the participants led to recommendations for future workshops to be held as a 2-day event to ensure all aspects of the agenda are carried out fully without rush. Finally, to participants, key challenges to the adoption of a particular intervention are the cost and time constraint and the long-term sustainability of the method.

4.4 Reflections

Most participants had prior knowledge of climate change and had put in place some adaptation measures. This made the delivery of the workshop quite easy. They were also eager to learn more, and especially into what other things they can use to combat its effect. It emerged from the workshops that individuals have different climate experiences and that people pursue different adaptation measures, but their suitability or feasibility depend on the socio-economic context where such actions take place. Hence, climate threats and adaptation actions are better understood when analysed from the context of the individual, family, and community scales.

The EMPOWER Ghana project highlights that individual adaptive actions to reduce climate risk can be grouped into four different categories: hazard/risk reduction or avoidance (action to prevent the risk from happening); vulnerability reduction (reducing the likelihood of being affected by climate threats); preparedness for response (measures to respond to ongoing climate threat), and finally, preparedness for recovery, which covers measures by individuals and

families to bounce back after a climate threat has occurred. To identify and analyse these actions requires a bottom-up approach using participatory systems mapping, a framework which is all-inclusive and tailored to understanding local needs and climate experiences.

In addition, most trade-offs were time-consuming and money intensive for participants. It will be great to study lower cost means of tackling potential threats. Moreover, it would be interesting to reflect on sustainable long-term interventions for participants with very ineffective strategies. Thus, what can be done to make them more effective? What other interventions can be imported from other regions to help them? A participant thinks it is critical for us to educate the community on alternative interventions, in which materials are also readily available in their environment to carry it out.

The Ghana team also made critical observations on the impact of some interventions on reinforcing the climate threats. For instance, the use of fans to counteract hot weather from high temperatures, increases energy consumption. This reinforces an already dire energy supply system, which is produced by hydro-power generation. The ant-ecosystems are destroyed when ant-hills are harvested into sandbags to curtail flooding. Furthermore, the land is degraded when sand is extracted to fill sandbags, which leads to feedback in coastal erosion, flooding and drought potential.

5.0 Conclusion

Climate change can cause incidence of natural hazards such as wildfires, flooding, heatwaves, droughts, vector-borne diseases, and mudslides. Such events can be deadly, traumatizing, and can cause significant damages to life, health, livelihoods, and wellbeing. Due to the increasing and complex nature of climate-related hazards, the state alone is often incapable of adequately responding to climate related hazards. The EMPOWER Ghana project shifted the focus from the state to the individual and the family level, revealing that climate adaptation actions by individuals are relatively effective, cost-efficient and more sustainable to implement. However, there are socio-economic trade-offs to individuals, households, and communities where such measures are regularly implemented. A holistic approach then could be a bottom-up strategy which embraces activities including capacity building, funding, training, and pursuit of collective and individual actions to mitigate climate threats in communities.

APPENDIX

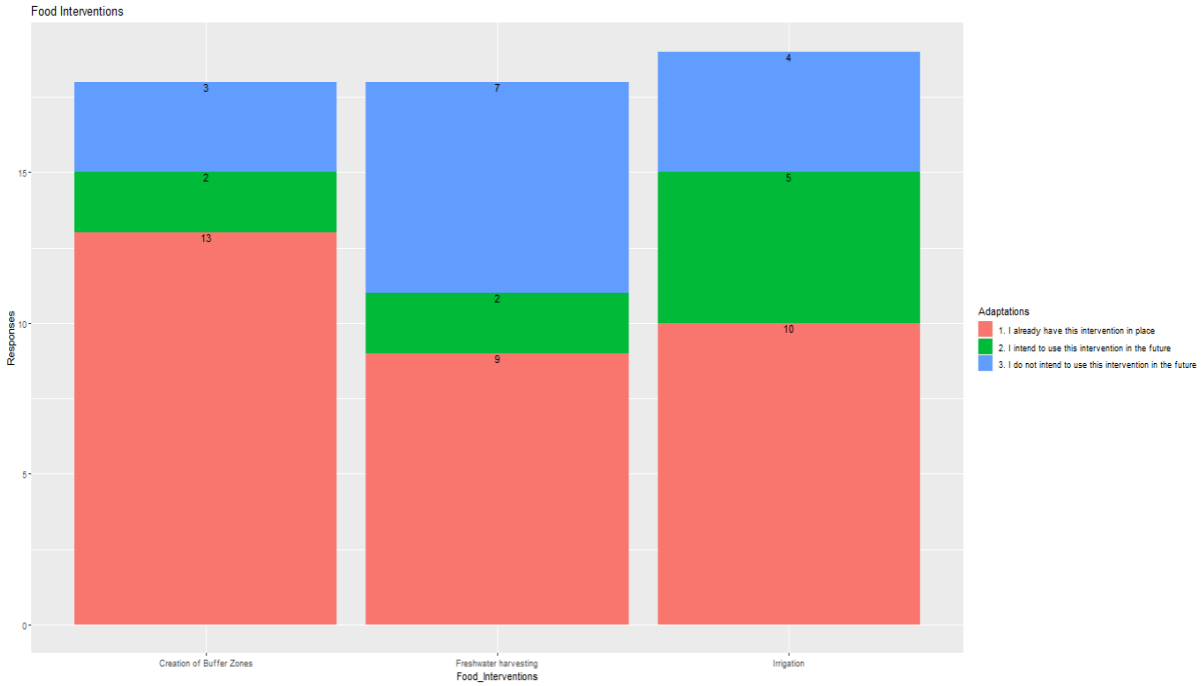


Figure A1: Number of participants responses to creation of buffer zones, freshwater harvesting and irrigation as interventions pertaining to food and water security.

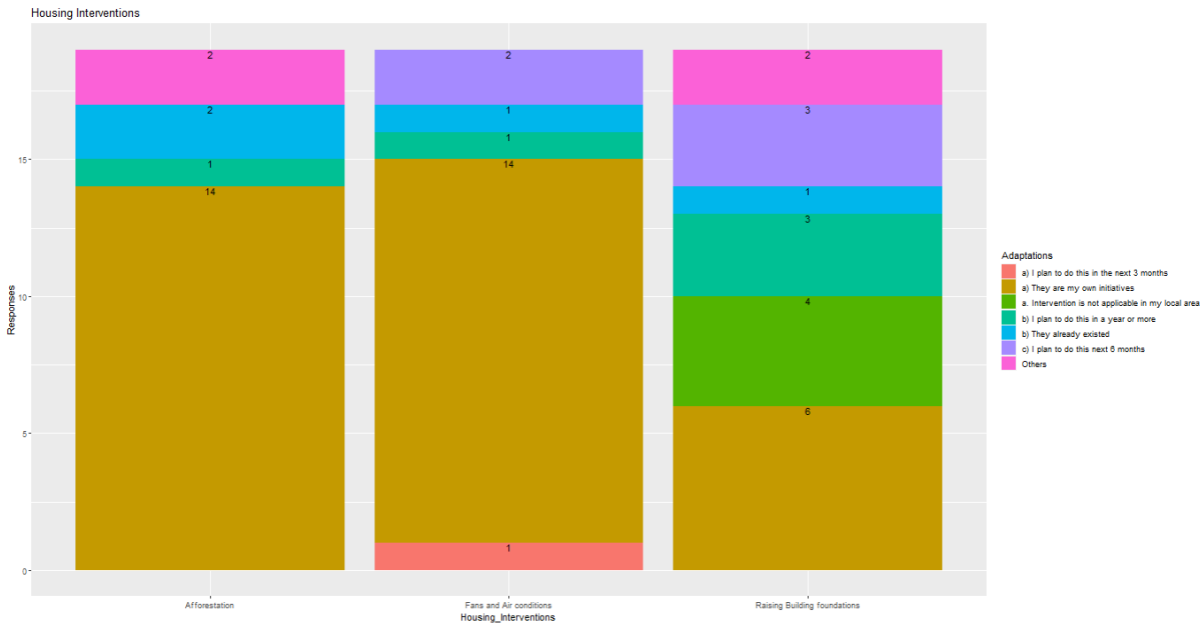


Figure A2: Number of participants responses to afforestation, use of fans and air conditions and raising of building foundations as interventions pertaining to housing conditions.

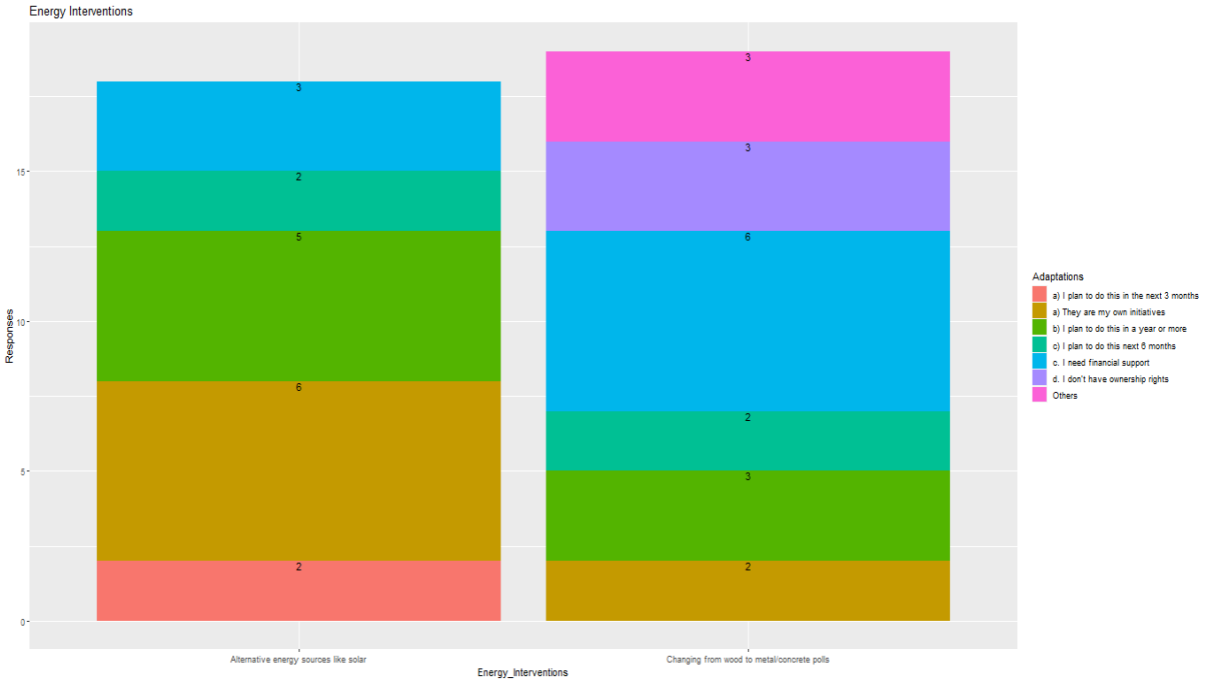


Figure A3: Number of participants responses to the use of alternative energy sources like solar, and changing from wood to metal/concrete polls as interventions pertaining to energy.

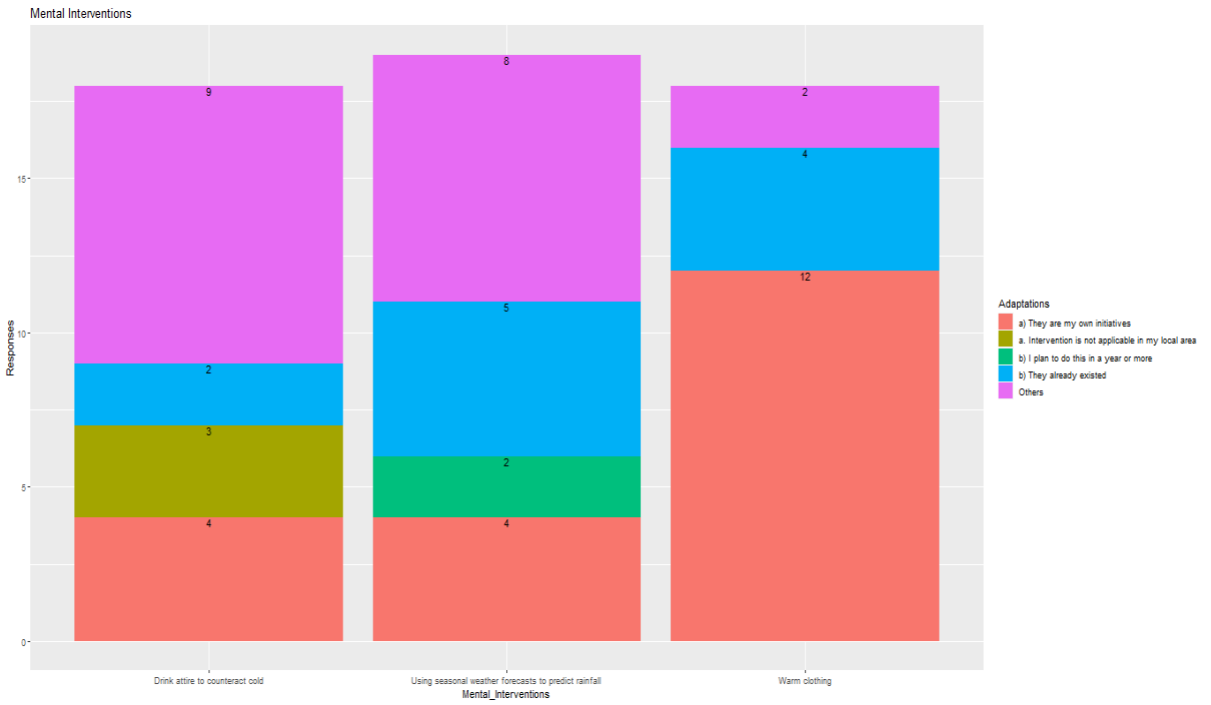


Figure A4: Number of participants responses to drinking of attire to counteract cold weather, use of warm clothing and use of seasonal forecasts to predict rainfall as interventions pertaining to mental health.

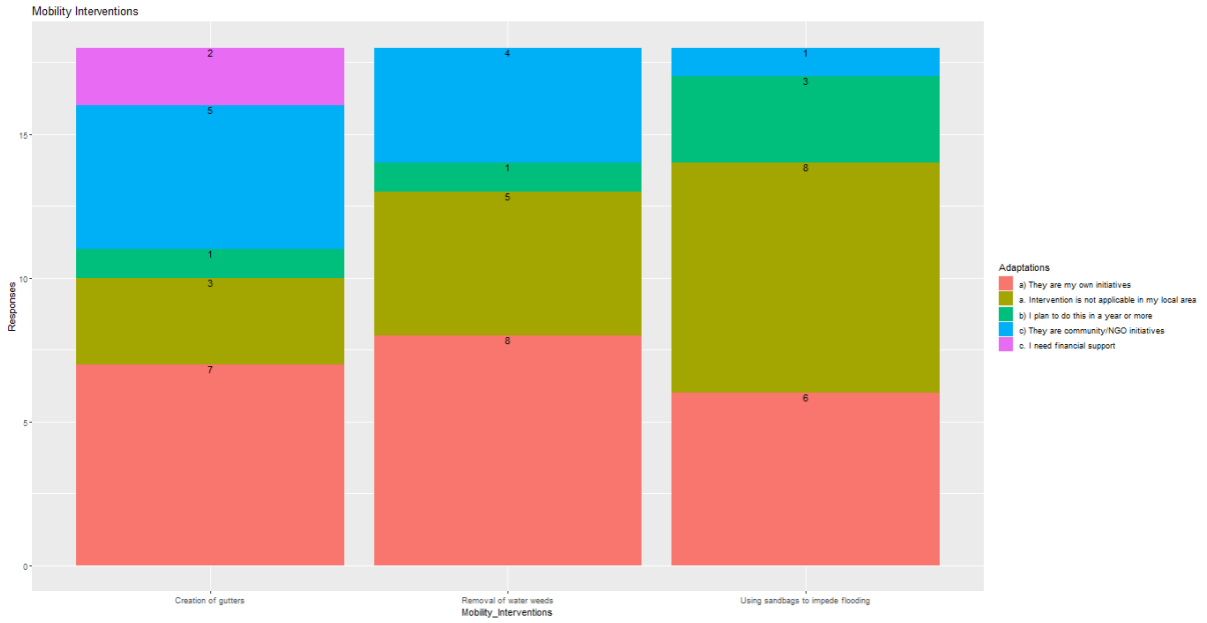


Figure A5: Number of participants responses to creation of gutter, removal of water weeds and use of sandbags to impede flooding as interventions pertaining to mobility and transport.

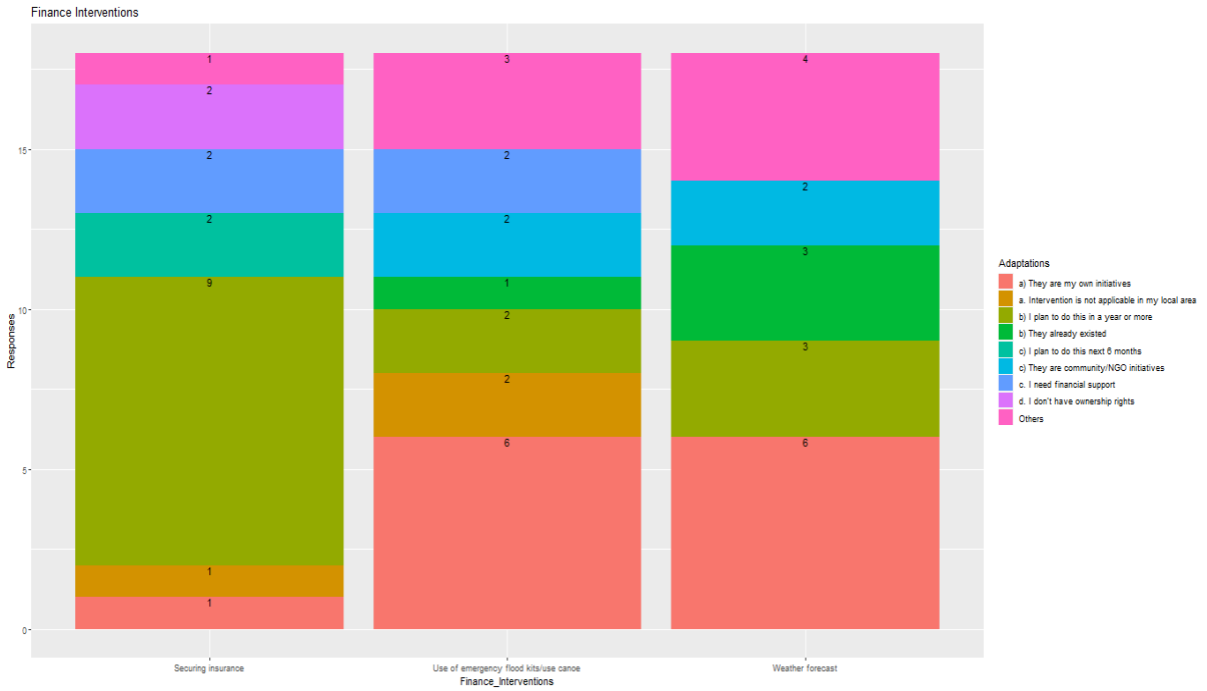
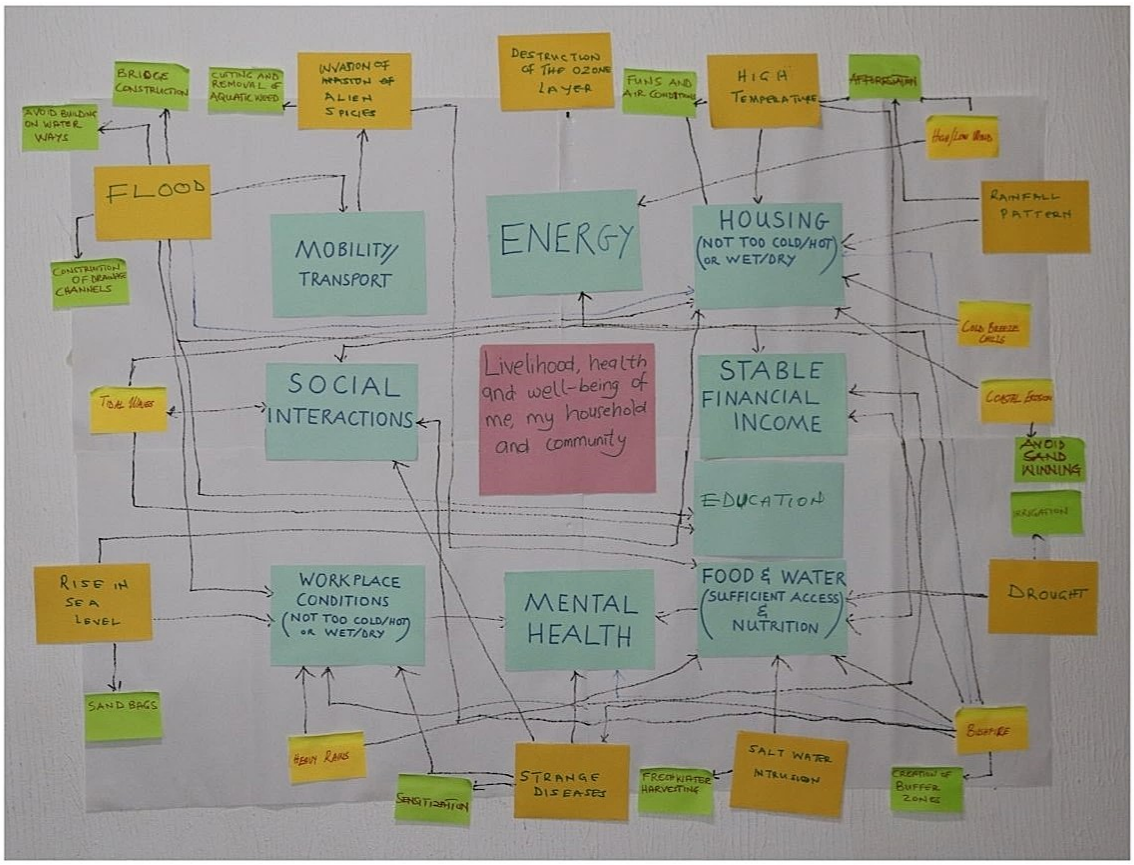


Figure A6: Number of participants responses to securing of insurance, use of emergency flood kits and weather forecasts as interventions pertaining to financial stability.



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