

# Community Based Initiatives and Strategies for Adapting to Wind Storm Disasters along the Black and White Volta Rivers in the Northern Region of Ghana

Abukari Wumbei

Laboratory of Crop Protection Chemistry, Faculty of Bio-Science Engineering  
Ghent University Coupure Links 653 B-9000 Ghent, Belgium

Seidu Al-hassan

Institute for Continuing Education and Interdisciplinary Research  
University for Development Studies, P.O. Box T.L. 1350, Ghana, Tamale

Bawa Judith A. K.

Institute for Continuing Education and Interdisciplinary Research  
University for Development Studies, P.O. Box T.L. 1350, Tamale, Ghana

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## Abstract

Climate change induced disasters have become a regular phenomenon in many parts of the world including Ghana, causing loss of human life and property. This paper particularly investigates how communities along the Black and White Volta Rivers in the Central Gonja district of the Northern region of Ghana adapt to windstorm disasters and to provide policy recommendations on effective strategies to enhance climate change adaptation and resilience. A sample of one hundred (100) respondents, 10 each from 5 communities along the White and Black Volta rivers were randomly selected and interviewed on their knowledge of and how they respond to the phenomenon. Key informant interviews were also held with key institutions of the district. The results reveal that majority of community members along the rivers rely on indigenous early warning systems for alerts on impending windstorms. Their adaptation strategies are varied and their resilience levels are very low. The paper therefore, recommends among other things that the capacity of communities be built on how to complement the indigenous knowledge system with scientific methods for early warning and preparedness in order to boost their resilience.

**Keywords:** Climate Change, Wind Storms, White & Black Volta Rivers, Resilience.

## Introduction

Ghana is situated in one of the world's most complex Climate Change regions, affected by tropical storms and the climatic influence of the Sahel and the Atlantic Ocean. The models and projections used to measure the signs of the phenomenon vary enormously, but show clear signs of Climate Change, confirming Ghana's vulnerability, particularly the Northern parts of the country (Bawa et al, 2015, UNDP, 2012). UNDP (2012) warned that as a result of climate change, the country should expect unpredictable climate patterns. The prediction is that the country will face more intense weather events, such as torrential rains, excessive heat and severe dry winds. Floods, for example, have become a recurrent phenomenon in Ghana. For example, in 2007 floods affected more than 300,000 people in the country, resulting in loss of life and property. These floods were believed to have cost the country more than \$25 million for emergency response, and resulted in more than \$130 million worth of direct damage (UNDP, 2012).

Climate Change has been recognized as developmental challenge to Ghana's Middle Income status. The 2008 national sectorial Climate Change vulnerability and adaptation assessments revealed the substantial impact of Climate Change on the national economy, with clear evidence that many of key economic assets on the coastal zone, the savannah zone, agriculture and water resources are affected, as well as social development in terms of poverty reduction, health and women's livelihoods (Bawa et al, 2015, NCAP, 2008). Ghana has made major progress on poverty reduction in recent decades. This notwithstanding, poverty persists in the north and in urban pockets and the poorest people are those who bear the brunt of Climate Change. A north-south poverty divide is exacerbated by climatic stress in the northern regions where temperatures are already relatively high. Lower agricultural productivity, flooding and rainstorms are only increasing the pressure to migrate to the south of Ghana (MEST, 2010, UNDP, 2012).

The signs of climate change are evident in the northern region of Ghana and manifested in the annual floods and windstorm disasters, particularly in riverine communities. The windstorms in particular, usually occur

at the beginning of the rainy season between March and April and towards the end of the season between September and October with lots of destruction property and sometimes human lives.

In 2010 for instance the storms set in between the period of January and March during which Six (6) out of the then 20 districts of the northern region suffered serious destruction in property such as farm land (6,451ha) and houses, rendering a total of 16,175 people homeless (NADMO, 2010, unpublished). The storm situation seems to worsen from year to year. For instance, from the period January to March, 2011, 16 out of the 20 districts had been hit by heavy storms resulting in the destruction of school blocks, houses, farms, animals and utility lines. It also rendered about 20,927 people homeless (NADMO, 2011, unpublished).

Rural communities are rarely able to access modern early warning alerts because they are located far from urban localities where these early warning systems are cited, they do not have access to electricity so are unable to listen to the radio or television, which usually broadcast or telecast the weather news. Where there is electricity, the people are unable to own particularly a television set. The only option left therefore, is to rely on the adaptation measures that they learnt from their forefathers *i.e.* the indigenous early warning systems for preparedness and resilience ( et al, 2015).

The paper therefore, seeks to investigate how communities along the Black and White Volta Rivers of the Northern region of Ghana adapt to destructive windstorms and proffer recommendations on how the indigenous knowledge systems could be used to enhance their adaptation and resilience to climate change related disasters. This is based on the strong link between the environment and disasters and between human practices and the environment (Judith et al, 2015, UNISRD, 2008). The specific objectives are:

1. To investigate the understanding and perception of the communities along the Black and White Rivers on climate change and its effects on their lives.
2. To explore how communities along the Black and White Volta Rivers adapt to wind storm disasters.
3. Explore the indigenous knowledge systems available in the communities for adapting to destructive wind storms.
4. To offer alternatives and more workable early warning signs for wind storms and how to adapt to them.

## Methodology

### Study Area

The Central Gonja District is located in the southern end of Northern region and lies within longitude 1°51' and 2°58' West and latitude 8°32' and 10°21' North with Bupe as its district capital. The district shares boundaries with the Kintampo North Municipality of the Brong Ahafo Region to the south, the West Gonja District to the west, the Tamale Metropolis to the north, the Tolon District to the Northwest and the East Gonja District to the east. It links the northern region with Southern Ghana. The district lies within the tropical continental zone with an unevenly distributed rainfall pattern from June to October and a dry season lasting from November to May and a mean annual rainfall of about 1,144mm. August and September normally record the heaviest rainfall and the highest number of rainy days. The rainfall is characterized by thunder and wind storms and or sharp showers. Erosion and flooding are commonplace due to the torrential nature of rains. The irregular distribution and short duration of the rainfall are a great limitation to crops and vegetative growth. This reduces food production to a single season and farming a risky business. The area is transverse by two major rivers, the White Volta and the Black Volta which also forms the southern boundary of the northern region of Ghana. A lot of streams crisscross the district and flow into the two rivers and eventually into the Volta River in the south of Ghana.

The district has a population of 87,877, according to projections made from the 2010 Population Census, with a male/ female ratio of 103 to 100 and a population density of 10.3inh/km<sup>2</sup>. The area covers a land size 8,544km<sup>2</sup>, which represents 12% of the land mass of the Northern region. The two major ethnic groups are the Gonjas and Dagombas, but the district also has a large community of migrant groups made up of Ewes and Batters from the Volta region of Ghana who live along the White and Black Volta rivers. The district has 256 communities. Farming and fishing are the occupations for majority of the people and the fishing is done along the rivers in Bupe and Yapei townships and other communities along the river banks.

Ten (10) communities along the two rivers *ie* five communities along the White Volta River and five along the Black Volta Rivers were randomly selected for the study. These are Amedzirovi, Junto, Yapei, Kantanga and Gbansah along the White Volta River and Bridge East, Bridge West, Dibriport, Peposu and Kikali No.4 along the Black Volta River. Kikali No. 4 is the point where the two Rivers meet (confluence) and flow into the Volta River. In each of the ten communities, 10 households were selected using a simple random design for interviews. For primary data, male or female household heads were interviewed and where there was no household head available, any person over 18 years was interviewed, giving a sample size of 100. One focused group discussion per community was also held. Key informant interviews were held with relevant institutions such as the District Assembly, the Ministry of Food and Agriculture (MoFA), the National Disaster Management Organization (NADMO), the Environmental Protection Agency, (EPA), the Ghana Red Cross Society, (GRS) and the Ghana Meteorological Agency (Gmet) on floods disasters and how people in the aforementioned

communities are adapting and what the best methods or strategies for adaptation are. Secondary data was sourced from books, journals articles, and reports on related research.

The data gathered from the field was analyzed using SPSS version 16 and MS Excel. A workshop was organized for representatives of the communities and stakeholder institutions where the results were validated.

## Results and discussions

### Socio-demographic characteristics of respondents

#### Age and Sex Distribution

The Age and Sex distribution of respondents in the study is presented in figure 1. The majority of respondents both male and female fell within the ages of 26 and 39 *i.e.* 22 male and 20 female and representing 42%, followed by age group 40 to 59 which has 22 male and 12 female representing 34%. Age group 60 and above had 13% respondents representing 8 male and 5 female and age groups 18 to 25 had the least respondents, *i.e.* 5 male and 6 female representing 11% of the respondents. The 26 to 39 age group recorded the highest numbers because they were available for the interviews and some of them had to be interviewed in place of household heads. The 40 and 50 age groups are regarded as the receptacles of indigenous knowledge, so their numbers helped to access that knowledge.

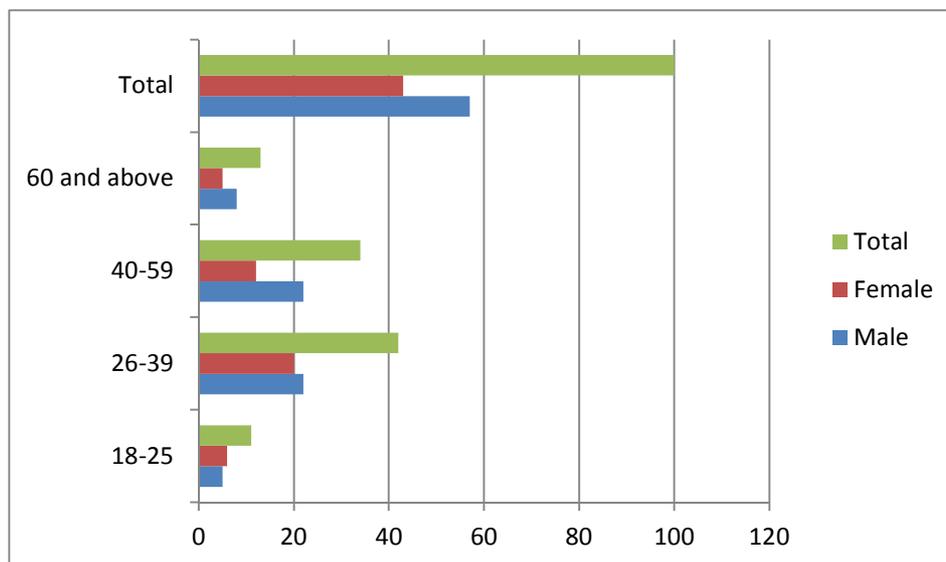
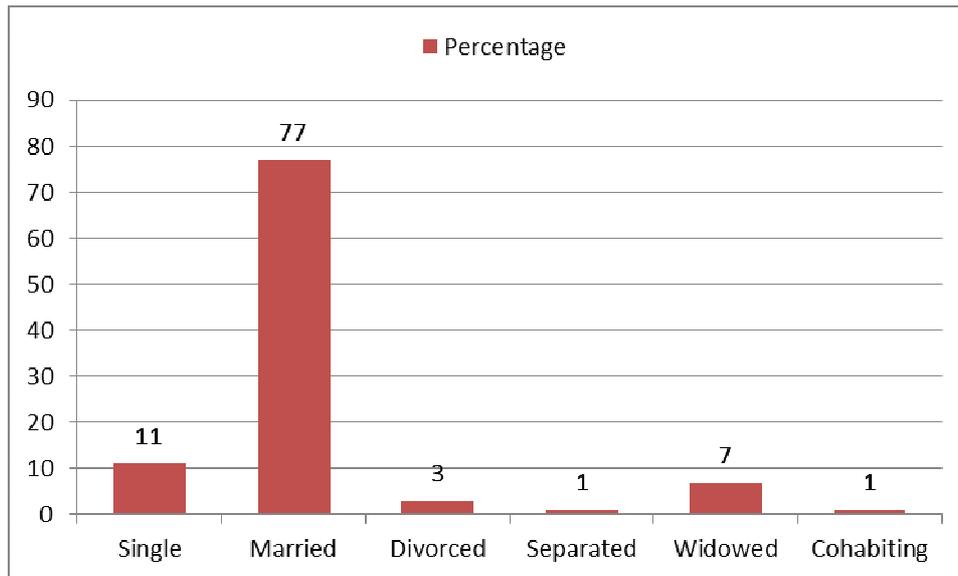


Figure 1: Age and Sex distribution of Respondents (Field data, 2014)

#### Marital status

Figure 2 below represents the marital status of the respondents. Majority of the respondents (77%) were married, 11% were single, 7% were widowed and 3% were divorced. One percent (1%) of respondents was separated and another 1% was cohabiting. Marriage in the study area is a status symbol, indicating maturity and the authority to speak on serious issues on behalf of the family. The family unit is the most affected by the destructive windstorms because in some cases houses and foodstuffs are lost and the survival of the family depends on the family head.



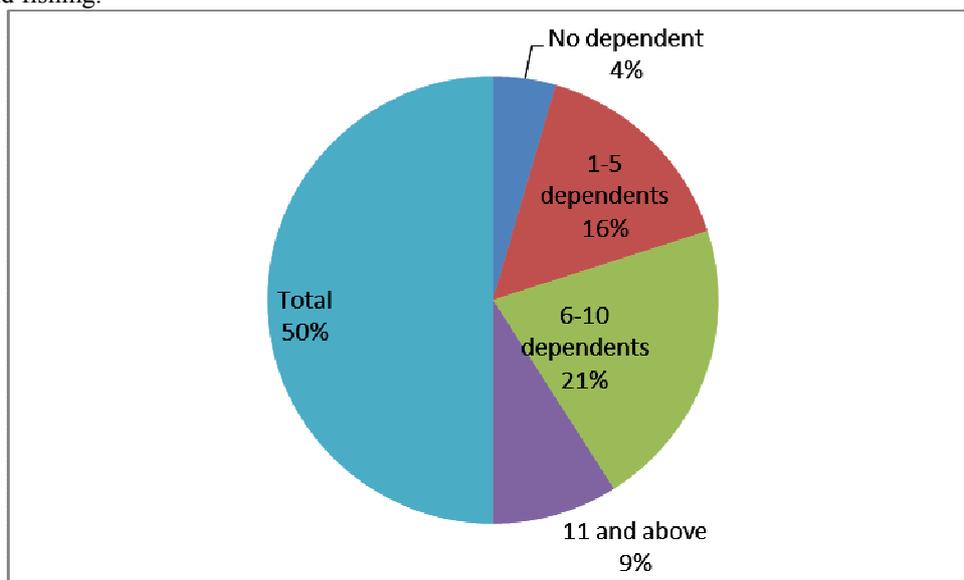
**Figure 2: Marital Status (Field data, 2014)**

### Level of Education

Out of a total of 100 households interviewed 71.0% had no formal education, 16% had basic education, 8% had tertiary education and 5% had secondary or vocational education. These statistics certainly should be a source of concern to the district authorities as well as the development partners since this has implication for the community members understanding and appreciation of climate change issues and ultimately their preparedness and response to climate change related disasters.

### Number of Dependents per Respondent

The paper observed that there is high dependency in communities fringing the Black and White Volta Rivers. As can be seen in figure 4 below, out of the total of 100 respondents interviewed, majority (42%) of them had between 6 and 10 dependents, 31% had between 1 and 5 dependents, 18% had 11 and above dependents and 9% had no dependent. This level of dependence coupled with the low level of education should be of a grave concern to communities who derive most of their livelihoods from weather/climate related activities such as farming and fishing.



**Figure 3: Number of Dependents per Respondent (Field data, 2014)**

### Occupation of respondents

The paper observes that fishing and farming are the dominant occupations in the area. Indeed, out of the 100 respondents interviewed, 46% of them mentioned fishing as their main occupation while 21% mentioned

farming as their main occupation. The next dominant occupation after farming and fishing in the area is trading, which attracted about 20% of the respondents. This is quite understandable, since after the catch or harvest, the people need to sell the produce for income. Farming and fishing are also “seasonal” activities, so the people need to trade in order to supplement the income from farming and fishing, which they claim is not able to meet their needs. The least occupations in the area as observed by the paper are government work and artisanship which attracted 5% and 4% of the respondents respectively. The above analysis agrees with the Central Gonja District Assembly’s decision to select/choose these communities as disaster prone and climate vulnerable communities.

### Community Members Knowledge and Understanding of Climate Change

The level of understanding of the people on climate change is very important for this paper because, when they know what the phenomenon is, they will have strategies by which they can overcome or minimize its negative effects, or to prepare adequately for it. Even though the knowledge and understanding of local people on contemporary and topical issues like climate change is sometimes under estimated, this paper reveals that a good proportion of the local people had a fair understanding of what climate change is. As can be seen in table 1 below, 56% of the respondents who claimed to have ever heard about climate change understood the phenomenon to be the change in the weather over a period of time while 24% indicated no understanding of climate change.

**Table 1: Respondents Understanding of Climate Change**

Definition	Frequency	Percent
Change of weather over a period of time	56.0	56.0
Don't know	24.0	24.0
The change in temperature and rainfall	8.0	8.0
The changes in the rainfall pattern and occurrence of flood	4.5	4.5
The increase in heat and wind in town	4.5	4.5
The continuous change in weather which accompanied by diseases like CSM and others	2.0	2.0
Change of the seasons as compared to previous years	1.0	1.0
The loss of trees	1.0	1.0

Source; Field data, 2014, n = 100

On whether the climate is changing or not, the paper emphatically established that the change in the global climate was not in doubt, as 98% of respondents agreed that the local climate was changing, with only 2% dissenting.

### Effects of Climate Change

The paper sought to find out respondents’ views about the general effects of climate change in the area and came out with very interesting revelations (Table 2). Majority of the people (42.0% and 40.0%) respectively held the view that climate change results in droughts and floods, which fall in line with what pertains in literature (Gyampo et al, 2009, UNISDR, 2008). Another 38.0% of the respondents saw reducing crop yields also as an effect of climate change.

**Table 2: Effects of Climate Change**

Effect	Frequency	Percentage
Droughts	42.0	42.0
Floods	40.0	40.0
Poor crop yield	38.0	38.0
Destructive windstorms	34.0	34.0
High incidence of disease vectors/ diseases	8.0	8.0
Pest invasion	7.0	7.0

Source: Field survey, 2014

n = 100

### Adaptation to Climate Change by Communities

The fact that the climate has changed and continues to change, with negative effects on the livelihoods of millions of people across the world is no longer in doubt and has left communities with an unavoidable option of finding pragmatic and innovative strategies for adaptation in order for them to continuously meet their livelihoods aspirations (Judith et al, 2015, UNEP, 2008, Kamara et al, 2005). The paper revealed that climate change adaptation measures/strategies employed by the communities are mostly derived from their traditional way of doing things such as; early cropping (54.0%), planting of early maturing varieties (41%), use of compost (19%) and mulching (14.0%). Others do valley farming and seasonal migration.

## Occurrences of Wind Storms, their effects on Communities and Communities' Responses

### *Occurrences of Wind Storms*

Windstorms are among the common climate change related disasters across Ghana and particularly in the three northern regions of Ghana. This paper in an attempt to find out how frequent people living along the two rivers experience heavy and destructive windstorms reveals that heavy windstorms are a serious disaster and occur even more frequently than floods which occurs ones in every two years (Judith et al, 2015). In fact, respondents, as can be seen in table 3 were more emphatic and unanimous on the occurrence of heavy windstorms as about 61% of them asserted that they experience heavy windstorms every year and about 20% and 14% respectively indicated that they experience the disaster every two and three years.

**Table 3: Frequency of Wind Storm Disasters**

Occurrence	Frequency	Percent
Every year	61	61.0
Every 2years	20	20.0
Every 3years	14	14.0
Every 4years	4	4.0
Every 5years	1	1.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

Source: Field survey, 2014

### *Effects of Wind Storms and Communities' Response*

This paper reveals that heavy windstorms which have become an annual occurrence in most parts of Ghana due to climate change has serious detrimental effects on the communities along the Black and White Volta Rivers. Indeed, in a multi response scenario, about 91% of the respondents recount with sadness how they usually lose their domestic property to heavy windstorms while 62% said they usually lose their farm produce when the heavy windstorms strike. Besides these two major effects, the other effects as enumerated by the respondents include; hunger, poverty, loss of lives and loss of livelihoods/investments. Though communities along these rivers appear to be less resilient to windstorm disasters, they still have their own ways of responding to the disasters anytime they occur. The communities own ways of responding to windstorm disasters as can be seen in table 4 can best be described as unsustainable. While majority (67%) said when the disasters strike they move out, re-roof their buildings and come back, about 15% of them indicated they look up to God for help. In the process of re-roofing their buildings they usually stay with family and friends, take relief items from the National Disaster Management Organization (NADMO) and other organizations if available or at worst buy building materials on credit

**Table 4: Community Response to Wind Storms**

Response to destructive windstorms	Frequency	Percent
Move out, re-roof and return afterwards	67	67
Move out to stay with family and friends	14	14
Replace building materials on credit	5	5
Take relief items from NADMO and philanthropists	8	8
Look to God for help (divine intervention)	15	15

Source: Field survey, 2014

n = 100

### **Indigenous Knowledge Systems on Wind Storms**

On the availability of indigenous knowledge systems or local signs for predicting heavy storms, it is revealed that not many people are aware of the availability and use local sings to predict heavy windstorms. Indeed, about 79% of the respondents claimed lack of knowledge for predicting destructive windstorms with only about 21% claiming that there exists local knowledge for the prediction of heavy and destructive windstorms. The indigenous knowledge systems available in the communities for predicting wind storms as related by the 21% of the respondents are captured in table 5 below.

**Table 5: Communities' indigenous systems (signs) for predicting Wind Storms**

Knowledge System	Frequency	Percent
Movement of wind and the direction of wind	11	11
The type and nature of cloud that precedes rain	10	10
Warning from Mallams and spiritualist	1	1

Source: Field survey, 2014

n = 100

### **Other Sources of Information on Wind Storms**

The paper explored other sources of information that alert communities of impending windstorms besides their

indigenous knowledge. It was revealed that they get information on the radio, (80%), TV, (17%), Community Meetings (9%), through Town Criers *i.e.* local information dissemination system (6%) and 14% said they got the information from friends (14%). The radio (FM) and TV stations give the weather forecasts by the Ghana Meteorological Agency (Gmet) as part of the news bulletins, but they added that these are sometimes not very accurate. The challenge in accessing this information through these channels is that most of the communities do not have access to electricity and so only few respondents had a television set, and that explains the high percentage of respondents who accessed the information through radio, because with the radio they can use dry cells batteries. Gmet admitted that the points of data collection for analysis for information was previously limited and the equipment they had could only give limited data, but added that they have started expanding the data collection points and are upgrading their equipment to international standards to give multiple indicators and expanding their coverage for better accuracy (Judith et al, 2015)

### Community Response to Early Warning Signs of Windstorms

In disaster management early warning signs are very critical enablers for effective preparation and for building resilience. This paper therefore, did not only explore community response strategies to windstorms when they occur, but how communities respond to the early warning signs of windstorms. As can be seen in table 6 below, communities make conscious preparations on getting the alerts. Majority of the respondents (26%) said they usually prepare for temporary relocation on observing the indigenous signs. The other preparedness measures mentioned include; trying to secure their property ahead of the windstorms (2%), investing less in the farm (2%), planting early in order to harvest before the end of year windstorms come (2%) and praying to God for guidance (2%). The responses to the scientific and modern early warning systems like the radio and TV announcements were similar to their response to the indigenous early warning signs.

God can be interpreted in two ways, a sign of helplessness and resignation to their fate or shows the religiosity of the communities who believe that everything that happens has a divine purpose and will thus make it easy to appeal to this sense for the responsible use of God's gift of the environment since it has been established that climate change is the result of Mans actions and inaction (Judith et al, 2015, Entuonovbe, 2011).

**Table 6: Response to Early Warning Signs of Wind Storms from indigenous and scientific sources**

Response to signs	Frequency	Percent
We prepare for relocation in case it happens	26	26
We try to secure our property ahead of the storm	2	2
Invest less in the farm	2	2
Plant early in order to harvest before the early	2	2
Pray to God for guidance	2	2

Source: Field survey, 2014,

n = 100

### Supporting Organizations to Communities during Windstorm Disasters

When wind storm disasters occur it is common to see philanthropic organizations stepping in to offer relief assistance. This findings further reveal that majority of the communities do not usually get support from any institution or organization (Table 7). This conforms to the findings by Judith et al, 2015 on floods where communities indicated that they usually relocate temporarily with support from family and friends in a way to cope with the floods. Indeed, community members asserted that when the wind storm disasters occur, organizations like NADMO do usually come around to write their names for relief items, but at the end of the day not much usually comes from NADMO. Besides the Assembly and NADMO other organizations that usually support disaster victims are the NGOs, WFP, UNICEF and the RED CROSS. The type of aid offered by these philanthropic institutions is usually material aid in the form of building materials, bedding, clothing, cooking utensils, food, drugs and drinking water with very little done to address the capacity of communities to be more resilient to the disasters.

**Table 7: Supporting Organizations to Wind Storm Disaster Victims**

Organization	Frequency	Percent
Assembly	1	1
NADMO	42	42
NGOs	18	18
Government	2	2
None	53	53
WFP	2	2
UNICEF	3	3
Red Cross	2	2

Source: Field survey, 2014

n = 100

### Interventions Needed at the Community Level to Address Heavy Windstorms

The study in an attempt to find out what could be done at the community level to make communities more resilient to windstorm disasters, reveals among other interventions that majority (57% and 44%) of the respondents were for tree planting and building materials respectively. The other interventions as can be seen in table 8 include; training of the youth in construction (18%), capacity building for NADMO (8%), permanent resettlement of affected persons (8%) and support with wind resistant crop varieties (6%).

**Table 8: Recommended Interventions to boost Community Resilience to Wind Storms**

Intervention	Frequency	Percent
Support with building materials that will make our buildings strong	44	44
Support with wind resistant crop varieties	6	6
Training of the youth in construction	18	18
Capacity building for NADMO to predict and respond effectively to wind disasters	8	8
Permanent resettlement of affected people	8	8
Massive tree planting in communities	57	57

Source: Field survey, 2014

n = 100

### Conclusions

Climate change related disasters such as floods have been a frequent phenomenon in the communities along the Black and White Volta Rivers in the Central Gonja district of the Northern region of Ghana in the last two decades rendering the people highly vulnerable. Farming and fishing as major occupations and source of livelihoods for majority of the people in the area are under serious threat by the windstorm disasters. Although the people in the area are well aware of these disasters, their resilience to them is low. Community members along the two Volta rivers i.e. the Black and White suffer destructive windstorms almost every year which manifests itself in many ways including loss of domestic properties and farm produce with very minimal support from government and her development partners.

The evidence shows that the communities rely on both indigenous and scientific ways to alert them on windstorms and have used these to adapt to the disasters over the years, but the indigenous systems have become unreliable due to the changing climatic conditions. The use of indigenous knowledge systems appears to be reducing as they are passed down orally from one generation to the other. Due to modernity, the oral traditions are becoming less useful. The scientific systems of disaster alert are not also very accurate due to obsolete equipment, whose data are unable to give accurate predictions.

### Recommendations

In order to boost the resilience of communities along the two Volta Rivers in the Central Gonja District to effectively address the impact of climate change vis-à-vis windstorms it is recommended, that a district wide climate change action plan should be designed and implemented by the District Assembly. There is the need to organize regular training and capacity building workshops for the district directorate of NADMO to effectively respond to disasters in the district. Particularly skills training for the youth of the area in climate resilient building and construction technologies and for the farmers is critical. The farmers should be supported with climate resilient crop varieties and farming methods.

Further, mounting of programmes to restore confidence in the indigenous knowledge systems as viable alternatives in complementing the scientific alert systems for disaster preparedness and resilience will be useful. Finally, there is the need to roll out interventions such as alternative livelihoods schemes for community members.

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