RESEARCH ARTICLE

Coping with Floods in the Savannah Region of Ghana

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Coping with Floods in the Savannah Region of Ghana

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Abstract
Human vulnerability to floods may be generated from human interaction with the environment. This interaction could result in an event that causes harm to humans by surpassing household and community resistance and resilience. This study sought to examine how decreasing access to and deteriorating conditions of key assets has increased human vulnerability to floods in the Savannah. The main aim of the study was to demonstrate how demographic characteristics of people affect their ability to access key assets to cope with floods. Two towns in the Savannah region which have been identified as highly vulnerable to flooding due to their history of floods were selected. Data collected and analysed for the study was both qualitative and quantitative and presented using descriptive and inferential statistics. The chi square test was used to determine relationship between variables. The results of the analysis showed that most of the respondents lacked access to key assets. Lack of access to these key assets affects their ability to anticipate, resist and recover from floods. At both study areas the most vulnerable groups were females and the aged. The study showed that respondents in the rural area were more vulnerable to floods than those at the urban centre. The study concludes that, to establish effective programs to reduce human vulnerability to environmental hazards, there is the need to understand how demographic characteristics affect ability to access key assets and influences level of vulnerability.

Keywords: Gender; age; hazards; vulnerability; resistance; resilience; urban; rural.

1. Introduction

In November 2010, 55 communities in the Central Gonja District located in the Savannah region of Ghana were affected by floods, about 700,000 people were displaced, 3234 houses collapsed, 23,588 acres of farmlands were destroyed at the cost of 116,340.22 US dollars [1]. Two prominent towns in the Savannah area which are mostly affected by floods are Buipe and Yapei in the Central Gonja District (See Figure 1).

Buipe, an urban centre within the district, was the most affected. Here, 12,418 people were displaced, 1196 houses and 81 acres of farms were destroyed at an estimated cost of 48,410.76 US dollars. Another area that was also highly affected was a rural settlement, Yapei, where 784 people were displaced and 298 acres of farms were destroyed at an estimated cost of 31,912.26 US dollars [1]. Natural hazards significantly affect community development in many parts of the Savannah area of Ghana due to the high prevalence of poverty and deepening vulnerability. Researchers have concluded that natural hazards represent potential risks and threats of detrimental interaction between human communities and natural events [2], and are also exceptional environmental episodes that causes harm to people and may surpass their ability to cope with its impacts.

Coping is the process of continuing on after flooding and involves resistance (ability to absorb losses and continue functioning as flooding occurs) and resilience (ability to recover from flooding). There are several strategies used in order to resist and be resilient to flood impacts. These strategies involve remedial actions undertaken by people whose survival and livelihood are compromised or threatened [3]. Research has shown that these strategies could be erosive, non-erosive and failed strategies [3]. Further, it has been found that these strategies vary by region, community, social group, gender, age, season and time in history and are deeply influenced by the people's previous experience [3].

Buipe is the district capital and an urban centre with a population of about 8347 people. Yapei, on the other hand, is a rural settlement with a population of about 4044 people. The two areas have a population growth rate of over 3.1% which is higher than the national growth rate of 2.8% [4]. Buipe and Yapei are

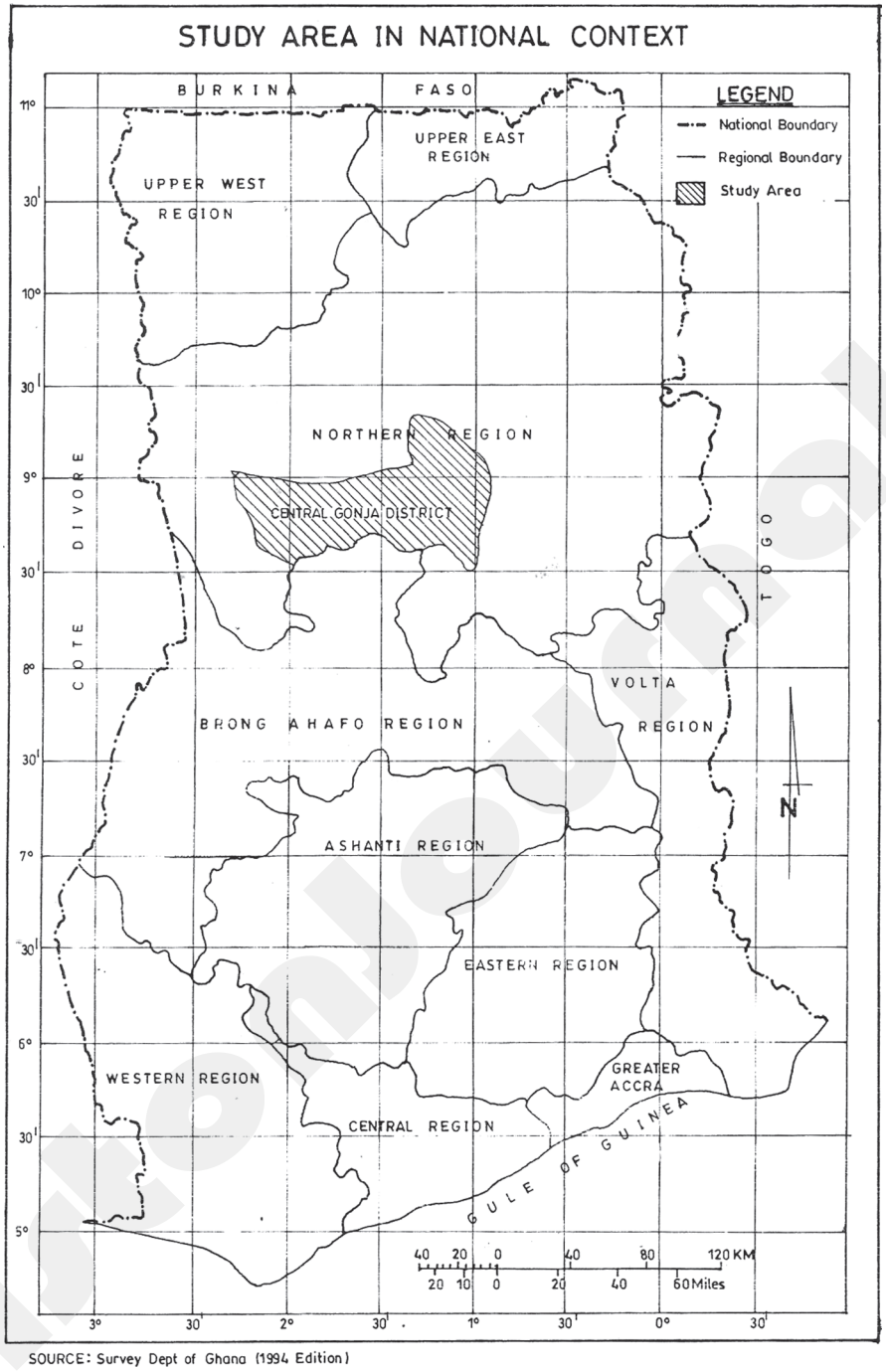

Figure 1: Location map of the study area in national context.

located along the Black and White Volta Rivers respectively. Rainfall in the area is unevenly distributed and mainly occurs from May to October. The mean annual rainfall ranges between 1000 and 1500 millimetres [5]. Highest rainfall amount in a single month is often recoded in the month of August which also has the greatest number of rainy days as well as very high intensity of rainfall of about 300 millimetres per hour [5].

The event of November 2010 is just one of the many natural disasters that have devastated the area. In the past few decades damaging rainfall and severe floods have occurred frequently in most areas in

the Savannah most of which has involved the loss of both human and animal lives, properties, and also serious disruption of economic and social activities. For instance, major flood disasters were recorded in 2003, 2007, 2009 and 2010 [1]. In 2003, flooding displaced 279 people and destroyed 223 acres of crops at an estimated value of 3,325 US dollars at Yapei [1]. In Buipe, the floods displaced 444 people and 42 houses were destroyed at an estimated value of 45,600 US dollars [1]. This data shows that the extent of natural disasters have dramatically increased in Central Gonja despite the fact that the recurrence of natural events has remained more or less constant.

However, in Savannah region of Ghana, increasing flooding impact is quickly attributed to excessive rainfall [1]. In Northern Ghana, assessments of human vulnerability that link socio-demographic characteristics to key assets are absent. The implicit identification of natural phenomenon as the only cause of disasters and the immediate need to reduce their impacts on the populations in the aftermath of the event, have obscured the analysis and inclusion of important social dimensions. If flood victims continue to suffer heavy losses, then explanations must be forthcoming. Since annual rainfall patterns have oscillated around 1000 to 1,500 millimetres per year, and monthly averages have not changed dramatically, increased flood impact must be attributed to human processes. Therefore, this research sought to find out how decreasing access to and deteriorating conditions of key assets has increased human vulnerability to flooding in the Savannah. The paper also examines the spatial differences in vulnerability to flood risk.

2. Methods

We simultaneously combined document analysis, interviewing of respondents, focus group discussions, direct observation and administration of questionnaires to gather data. The units of analysis were households and communities. A household has been defined as a person or group of persons who live together, share the same living arrangements, and consider themselves a single unit [6]. In this definition, household residents need not be related by blood or marriage, but simply cohabitate. It follows that the term family is not synonymous with household in this context, even though family members who live in different households often involve one another in decisions concerning production and consumption. We chose the household because this is the basic unit of production and consumption. The household, in other words, is the unit that owns valuable assets and determines coping responses and strategies. The communities were chosen due to their history of floods.

Due to the size of the population and limits to our time and resources, we used sampling in selecting part of the population to represent the whole. To allow all units in the population an equal chance of being selected, the probability sampling technique was used. The multistage cluster sampling was used for the selection of the sample units. In the first stage, communities were selected through simple random technique. At Buipe, the communities included Buipe Bridge, Yipala, Goroase, and Worontu. Using the fish bowl method, numbers were written on pieces of papers, numbered one to four, each number represented a community. Buipe Bridge was randomly chosen. At Yapei, the communities included Daresalam, Quarters, Old Yapei and Madina Line. The fish bowl method was again used in the selection of the neighbourhood. Old Yapei was randomly chosen.

The second stage of the multistage cluster sampling involved the selection of households from the selected neighbourhoods. The total number of households in Buipe was 1264 [4]. Twelve percent of the total number of households was chosen as the sample size. The total sample size for Buipe Bridge was 152. At Yapei, the total number of households was 542 [4]. Again, 12% of the total households were chosen as the sample size. The total sample size was 65. Again at the second stage the procedure for selecting households was systematic. In both communities, the sampling fraction was obtained by dividing the sample size by the total number of households. The sampling fraction was one-eighth for both communities. To ensure validity of inferences as well as avoiding bias, the starting point for the selection of units was selected randomly. At Buipe the random number chosen was 5. At Yapei 3 was chosen. In the study areas, some of the houses were compound houses that contained more than one household. Where there were more than one household only one head of household was interviewed. This was based on the assumption that all members in the household shared the same socio-demographic characteristics, flood experience and coping strategies.

Both primary and secondary sources of data were used for the research. Primary data collections instruments used for the research were focus group discussion, questionnaires and interviews. Secondary

data collection instruments used for the research includes documents, journals, newspapers and also reports from National Disaster Management Organisation (NADMO), and Central Gonja District Assembly. Reports from NADMO were used to get data on available flood statistics. Rainfall figures were obtained from the Ghana Meteorological Agency. This was to support the argument that physical characteristics such as rainfall are not the sole causes of vulnerability to hazards. Again, reports were taken from the Central Gonja District Assembly on the backgrounds of the communities.

Structured interviews were used for the head of institutions. Institutions which were interviewed include the Central Gonja District Assembly, National Disaster Management Organization and Ministry of Food and Agriculture. Structured interviews were used to seek opinion of the institutions on the mitigation strategies provided by them, causes of flooding and vulnerability, access to key assets and why recovery and not relocation has been the choice of the people. Questionnaires were used for heads of households. The questionnaires were divided into sections which included socio-demographic characteristics of respondents, building structures, flood experiences, recovery and assets of respondents.

Focus group discussions were used for community elders. Both women and men were of different ethnic groups and had stayed in the community for more than 30 years. Focus group discussions were used to provide more information on flooding. The discussions were used to generate data on changes in the occurrence of flooding, community assets, access and how they have changed over time. We had two different discussions at Buipe. The discussions were carried out on the 14 October 2011 but at different times for both men and women. The focus group at Buipe constituted 15 peoples (7 men and 8 women). The discussions lasted for about 138 minutes (65 minutes for men and 73 minutes for women). In Yapei the focus group constituted 14 peoples (7 men and 7 women). The discussions lasted for 135 minutes in Yapei (65 minutes for women and 70 minutes for men). Data was analysed using the Statistical Package and Service Solution (SPSS). In testing the hypotheses, inferential statistics were used on making inferences about the characteristics of populations based on sample data. The chi square test was used for hypothesis which involved two categorical variables. The hypotheses tested were gender which does not influence access to key assets. Age does not influence access to key assets.

3. Results and Discussion

Human populations have become more vulnerable in recent years, despite the numerous steps being taken to reduce disasters [7]. Many have therefore considered vulnerability to environmental hazards not as a result of the physical location of people in many precarious areas but as a result of lack of access to key assets such as education, land, loans, help and secure housing. People's vulnerability to hazards is generated by social, economic and political processes [8]. These processes influence how hazards affect people in varying ways and different intensities [8]. This section presents the findings from the study and shows how demographic characteristics of individuals or groups affect their ability to access key assets and how it affects their ability to cope with hazards.

Asset has been variously defined by different people. Assets have been identified as stock of financial, human, natural or social resources that can be acquired, developed, improved and transferred across generations. It generates flows or consumption, as well as additional stock [9]. Assets have been defined by Bebbington [10] as 'not simply resources that people use to build livelihoods, but they give them the capability to be and act'. In recent times, assets or capital endowment includes both tangible and intangible assets [11, 12]. These include physical, financial, human capital, social and natural capital.

All the five assets were used in the study, these include land (natural), education (human), loans (financial), secure housing (physical) and assistance (social) from friends, relatives, government and non-governmental agencies. We used these assets because they can help residents affected by floods to anticipate, resist and recover from flood impacts. Assets such as land and secured houses can be used for productive purposes. Also they represent a store of value that can be turned into cash when needed. Access to education can help individuals understand warning information, gain knowledge and skills and also employment in the formal sector which helps individuals to withstand the impacts of floods. Again financial assets such as loan help in the speedy recovery of disaster victims. This is because it can be used to restore properties that have been destroyed. Recent studies suggest that assets are important for reducing poverty, and cushioning risk and vulnerability from natural disasters, illness or financial crises [13]. It is now widely recognized that ownership and control over assets such as land and housing provide direct and

indirect benefits to individuals and households, including a secure place to live, the means of a livelihood, protection during emergencies, and collateral for credit that can be used for investment or consumption [13].

Some socio-demographic characteristics have been identified by some researchers to having influenced vulnerability to hazards. These include age and gender. These characteristics influence access to key assets and affect people's vulnerability to environmental hazards. Again socio-demographic characteristics like gender could prevent one's ability to cope from the impacts of hazards. For instance, studies have shown that women and children are 14 times more likely to die than men during a disaster. In the 1991 cyclone disasters which killed 140,000 in Bangladesh, 90% of victims were women [14]. In Sri Lanka, males were mainly taught swimming and tree climbing, which helped them survive and cope better than females when the waves of the tsunami hit. Social prejudice keeps girls and women from learning to swim, which severely reduces their chances of survival in flooding disasters [15]. Also, it has been concluded that, more women than men work in the informal sector and in small enterprises. These sectors are often the worst hit and least able to recover from the effects of disasters, due to lack of capital, and limited access to credit and information, among other obstacles [16].

3.1. Gender and access to human, natural, social, financial and physical capital

At the urban centre, 65.1% of the samples were males while females in the sample represented 34.9%. At the rural settlement, males constituted 83.08% of the sample and females constituted 16.92%. In both areas of research, there were more households headed by men than women. This could be as a result of the Ghanaian traditional system, where men are recognized as the head of households. Again this could also be a sampling error. However, Buipe has more females as household heads than Yapei. Most of the females who were household heads were widowed or divorced.

In the two study areas, females appeared to be more disadvantaged in asset ownership than men. Limited existing information shows that women in many countries are far less likely than men to have ownership or control of productive assets. In addition, women may not receive the benefits of assets held by men, even when they live in the same household [17]. Beyond empowering women, productive assets play an important role in reducing poverty [13]. A key element in poverty reduction is strengthening the ability of households and individuals to respond to aggregate shocks, such as droughts or floods, as well as idiosyncratic shocks, such as illness or divorce [13]. The possession of assets helps households and individuals to cope with vulnerability and avoid impoverishment [18, 19]. When people have more assets, they experience less vulnerability and insecurity in the face of risks; conversely, the more assets are eroded, the greater is people's vulnerability [20].

Assets help flood victims anticipate, resist and recover from floods. However societal processes sometimes affect people's ability to access these key assets. For instance, Government policy, social norms, intra-family arrangements, and the market determine ownership and accumulation of assets. Gender biases in each of these different institutions and practices limit women's ability to obtain and keep assets [13]. Table 1 below shows gender and access to all five assets in both study areas. In the study at the urban centre, 32% of the sample had formal education with 27% as males (10% had primary education, 10% had basic education, 4% had secondary education and 3% had tertiary education) and 5% as females (3% had primary education and 2% had basic education). However, in the rural centre only 14% of the males in the sample had access to formal education. Out of this percentage, 5% had primary education, 7% had basic education and 2% had secondary education. None of the females in the sample had access to formal education. Even though more men have been educated than women in the communities, the number is not significant especially at Yapei.

Table 1: Gender and access to education, land, social network, loans and houses at Buipe and Yapei.

Gender	Assets									
	Education (%)		Land (%)		Help (%)		Loans (%)		Housing (%)	
	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei
Males	27	14	33	44	18	16	29	6	39	80
Females	5	0	9	5	7	3	18	0	24	15

Land is described as a critical productive asset for the poor in rural communities while in urban areas land for shelter is also a critical productive asset [10, 21–26]. However in the survey areas land was used as a productive asset. Land was used for farming purposes whiles others used it as an asset which they could rely on in times of hazards. From the study, we found out that, 33% of males at Buipe and 44% of males at Yapei in the sample owned land. Also 9% of the females at Buipe and 5% of the females at Yapei owned land. The percentage of females who owned land is smaller than the percentage of males who owned land. Studies carried out in other African countries showed that percentages of women who owned land were not significant. In Uganda only 7% of women own land themselves [27]. Doss [28] found that women owned land in only 10% of Ghanaian households while men owned land in 16–23%. This depended on the year of the survey. Land as discussed earlier is a productive asset in the study areas. However in times of disasters lands were sold in order to recover from flood impacts. In both study areas percentage of women who owned land was not significant. This affects their ability to recover from flood consequences. More males in the study areas were able to recover faster than females.

Financial capital is becoming central to the other forms of capital assets in the globalized world [29]. Access to financial capital could enable flood victims to recover quickly from the impacts of floods since it enables victims to restore all their losses. At the urban centre, 29% of males and 18% of females had access to loans from financial institutions whiles 6% of the sample at the rural centre being males had access to loans not from financial institutions but from friends and relatives. None of the females at Yapei received any form of loan. From the research, more females had access to loans than males in the urban centre. This means that females had an advantage as regards to access to this asset than their male counterpart. However at Yapei, there were no financial institutions as at the time the data was collected. In a focus group discussion, one woman said "there are no banks in this community so we don't save and are not even able to secure loans like those at Buipe. We used to save with some men who come around but they have run away with our monies. They took my GH¢ 300 away". Access to financial capital helps in recovering from the impacts of floods. This is because financial capital helps to restart businesses, lives and also to get all properties that were lost.

Households are important adaptive institutions and act as safety nets in times of economic difficulty [30]. At Buipe and Yapei, households acted as safety nets for those whose houses were flooded and destroyed as some of them packed their belongings and stayed with friends and families. Also access to help enabled some respondents to anticipate and recover from flood consequences. Those who did not receive help had to stay in schools, verandas, tents and abandoned structures. This affected the health of some respondents. With regards to social capital at Buipe 18% of males and 7% of females received help from friends and relatives. However at the rural area, 16% of males and 3% of females received help during the 2010 floods.

Housing quality is an important indicator of flood vulnerability [31]. For example, in his study, households in a grass-thatched house were perceived to be more vulnerable to floods than households in a stone house, whose housing structure represents high coping capacity and more resilience to flood hazards. Housing quality helps to resist the consequences of flood. In both communities, houses built of cement blocks were more resistant to floods than houses built of mud. Mud houses are not able to withstand the impacts of floods and easily collapse. At the urban centre, 39% of men owned and lived in their own houses whiles 24% of women owned and lived in their own houses. Out of this percentage, 13% of the males and 4% of females own houses built of cement blocks. At the rural centre, 80% of males and 15% of females own houses. Out of the percentage of males who own and lived in their houses only 6% had their houses built of cement blocks. None of the females owned a house built of cement blocks. Houses built of mud were destroyed during the 2010 floods. Houses built of cement were able to withstand flood impacts. Those who owned houses built of cement were able to rent it out and made monies. This enabled them to recover from the flood impact, majority of who are males. Plates 1 and 2 show housing qualities in Buipe. A cement house has been able to withstand floods while the mud houses could not.

To test for the level of significance between gender and access to assets, the chi square test was used with a 5% confidence level. At Buipe, there are more men educated than women. There is a statistically significant relationship between gender and access to education in Buipe at 5% confidence level with a *p*-value of 0.007. The situation has been attributed to the religious and socio-cultural practice and value

Plate 1: Block house that had been able to resist flood.

Plate 2: Collapsed mud houses.

system of the people which tend to marginalize the full development of females. Again there are more men educated at Yapei than women. However there was no statistically significant relationship between gender and access to education at a 5% confidence level with a *p*-value of 0.546. At the urban centre, more males owned land than females. There was a statistically significant relationship between gender and ownership of land at a 5% confidence level with a *p*-value of 0.002. At the rural centre, however even though more men owned land than females there was no statistical significant relationship between gender and access to land at a 5% confidence level at a *p*-value of 0.110.

Again at the urban centre the results of the hypothesis tested between gender and access to help was not statistically significant at a 5% confidence level with a *p*-value of 0.201. However more males had access to help than females. At the rural centre even though more males had access to social capital from friends and relatives than females there was no statistical significant relationship between gender and access to help with a *p*-value of 0.869 at a 5% confidence level. This may be due to the fact that household relation among households is deteriorating especially among females. Also it could be as results of the socio-cultural settings of the communities were males are more recognized than females.

At the urban centre, there was no statistical significant relationship between gender and access to loans at a 5% confidence level, the *p*-value was 0.444. However more females received loans from financial institutions than males. Also at Yapei there was no statistically significant relationship between gender and access to loans with a *p*-value of 0.351 at a 5% confidence level. Again there was no statistical significant relationship between gender and access to houses at a 5% confidence level both at Buipe and Yapei. The *p*-values were 0.147 and 0.438 respectively. The values for the hypotheses test are presented in Table 2.

Table 2: Chi square test on gender and access to assets.

Chi square test	Education		Land		Help		Loans		Housing	
	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei
Values	14.126	2.128	9.598	2.554	1.632	0.027	0.586	0.868	3.836	0.602
D.f.	4	3	1	1	1	1	1	1	2	1
Asymp. sig. (2-sided)	0.007	0.546	0.002	0.110	0.201	0.869	0.444	0.351	0.147	0.438

Table 3: Gender and rate of recovery at Buipe and Yapei.

Gender	Counts and percentages			
	Less than a year (%)		More than a year (%)	
	Buipe	Yapei	Buipe	Yapei
Males	43	34	22	49
Females	8	0	27	17

The findings from the study showed that males had better access to assets than females. This therefore affected the ability of the female respondents at both study areas to anticipate, resist and recover from flood impacts. From the data gathered as presented in Table 3, 43% of males and 8% of females recovered from the impacts of floods at the urban centre in less than a year. However, 22% of males and 27% of females had not recovered as at the time of collecting the data. This is as a result of differences in asset ownership where males seem to dominate in ownership of assets than the females. At the rural centre, only 34% of the sample recovered in less than a year after floods. None of the females in the sample recovered from the flood impacts as at the time of data collection. Again, 49% of males and 17% females had not recovered from the 2010 floods. Even though more males recovered than females in Yapei, the number is not as significant as that of Buipe. The findings showed that females in the study areas were more vulnerable to floods than their male counterparts. However residents at Yapei are more vulnerable to floods than those at Buipe this is because of the differences in access to assets which affects their ability to resist and recover from floods quickly before the occurrence of another flood.

3.2. Age and access to human, natural, social, financial and physical capital

This section shows how age affects access to assets in the study areas. The age groups were put in to two groups that is less than 60 and 60 years and above. In Ghana, the retirement age is 60 years. We wanted to find out how age affects access to assets and vulnerability to floods. At the urban centre, those who were less than 60 years represented 75% whiles 60 years and above constituted 25% of the population. At Yapei, 58.5% of the population were below 60 years and 41.5% were 60 years and above.

It's been stated that age also influences one's ability to cope with disaster. Eldar [32] points out elderly persons may have some impairment, such as those of sight or hearing which may limit them in perceiving warnings and emergency instructions. Others will reduce their ability to carry out recommended self-protected actions or their speed and agility in leaving a room or building. At the urban centre, 28% of those below 60 and 4% of those above 60 had access to formal education whiles at the rural centre 12% of less than 60 years and 2% of those above 60 years had access to formal education (primary education). Out of the 12% of those less than 60 who had access to formal education at Yapei, 3% had primary education, 7% had basic education and 2% had secondary education. At the urban centre, out of the percentage of those less than 60 years, who had formal education, 12% had primary education, 9% had basic education, 4% had secondary education and 3% had tertiary education. Table 4 below shows age and access to all the

Table 4: Age and access to education, land, social network, loans and houses at Buipe and Yapei.

Gender	Assets									
	Education (%)		Land (%)		Help (%)		Loans (%)		Housing (%)	
	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei
Less than 60 years	28	12	32	29	19	8	34	4	45	55
60 years and above	4	2	9	20	6	11	13	2	18	40

five assets in the study areas. The findings in both study areas shows that those less than 60 years had better access to formal education than those 60 years and above. This shows that those less than 60 had more knowledge and skills, had better opportunity to be employed in the formal sector and also understand warning information about floods.

Land has been described as a productive asset in the rural centres by some writers. At Yapei, 29% of those below 60 years and 20% of those who are 60 years and above owned land whiles 32% of the working population and 9% of those in the retirement age in the urban centre owned land. The finding at the urban centre shows that more of those in the working age group owned land than those in the retirement age group. Land helps respondents to recover from flood impact. This is because it is sold in order to recover from flood consequences.

As stated initially, financial capital is becoming central to the other forms of capital assets in the globalized world [29]. At the research areas the elderly seems to be disadvantage in access to financial capital which is becoming central to other forms of capital. At the urban centre, 34% of those in the working age group and 4% of those in the working age group in Yapei were able to receive loans. Also 13% of those in the retirement age group at Buipe received loans and 2% of those in the retirement age group at Yapei received loans. Again those at Buipe had better access to financial capital than those at Yapei. This therefore affected their ability to recover from flood impacts.

Again housing quality determines people's vulnerability to hazards. At the study area, 45% of those in the working age group owned houses while 55% in the working age group at Yapei owned houses. However, 18% of the sample at Buipe and 40% of the sample at Yapei in the retirement age group owned and lived in their houses. At Yapei, 4% of those in the working age group owned houses built of cement whiles 2% of those in the retirement age group owned houses built of cement. At Buipe, 11% of those in the active age group and 6% of those in the retirement age group owned houses built of cement blocks. Majority of those who owned houses built of cement blocks are those below 60 years. However there are more houses built of cement blocks in Buipe than Yapei.

Access to social capital enabled some respondents to anticipate and recover from flood consequences. Those who did not receive help had to stay in schools, verandas, tents and abandoned structures. Plates 3 and 4 shows a tent and a school where respondents had to sleep after their houses were covered by flood water. From the sample, 19% of those at Buipe and 8% of the sample at Yapei in the working age

Plate 3: A tent occupied by victims.

Plate 4: A school building occupied by victims.

Table 5: Chi square test on age and access to human, natural, social, financial and physical capital.

Chi square test	Education		Land		Help		Loans		Housing	
	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei	Buipe	Yapei
Values	10.201	4.898	1.093	0.022	0.047	1.014	0.714	0.480	1.567	0.087
D.f.	4	3	1	1	1	–	1	1	2	1
Asymp. sig. (2-sided)	0.037	0.179	0.296	0.883	0.398	0.488	0.398	0.488	0.457	0.768

group received help from friends and relatives. In the retirement age group, 6% at Buipe and 11% at Yapei received help from friends and relatives. Help from friends and relatives were in the form of accommodation, provision of food stuff and provision of warning information.

Again the chi square was used to make inferences from the population. The values for the hypotheses (Age does not influence access to assets) test are presented in Table 5. The findings of the research showed that, majority of those who are less than 60 years received loans than those 60 years and above. However the result was not statistically significant at Buipe at 5% confidence level. The *p*-value was 0.398. Again, the findings at Yapei showed that, more of those below 60 years borrowed than those who are 60 years and above. The result was not statistically significant at a 5% confidence level, with a *p*-value of 0.488. The findings at Buipe showed that, majority of those below 60 years had access to social capital than those who are 60 years and above. However, the result was not statistically significant at 5% confidence level. The *p*-value was 0.829. Again, results at Yapei showed that more of those who are 60 years and above had access to social capital than those below 60 years. However, the result was not statistically significant at a 5% confidence level. This is because the *p*-value was 0.314. With regards to education, there was a statistical significant relationship between age and education at a 5% confidence level at Buipe. The *p*-value was 0.037. Again even though, more of those below 60 were educated than those 60 and above there was no statistical significant relationship at a 5% confidence level at Yapei. The *p*-value was 0.179. At Buipe there was no statistical significant relationship between age and access to land at a 5% confidence level. The *p*-value was 0.296. Also there was no statistical significant relationship between age and land at a 5% confidence level. The *p*-value was 0.883. The *p*-values for age and access to secured houses are 0.457 at Buipe and 0.768 at Yapei at a 5% confidence level. There was no statistical significant relationship between the two variables.

In both study area, the aged were unable to recover in less than a year after floods. This can be attributed to lack of access to the assets described above. This therefore affected their ability to anticipate, withstand and recover from flood impacts making them the most vulnerable groups. From the findings, 42% of those below 60 years and 9% of those who are 60 years and above at Buipe recovered from flood consequences in less than a year. At Yapei, 23% of those in the working population and 11% of those in the retirement age group recovered in less than a year. These percentages are presented in Table 6 below. Majority of those who recovered from floods in less than a year were those below 60 years. More residents at Buipe were able to recover faster than those at Yapei. This is as a result of differences in access to key assets which is as a result of spatial location.

Table 6: Ages and rate of recovery at Buipe and Yapei.

Age	Counts and percentages			
	Less than a year (%)		More than a year (%)	
	Buipe	Yapei	Buipe	Yapei
Less than 60 years	42	23	33	35
60 years and above	9	11	16	31

4. Conclusion

The outcome of the study showed that characteristics of natural events are not sufficient to explain human vulnerability to environmental hazards but rather social processes in both communities causes human vulnerability to floods. This is because most of these people lack the assets that will make them anticipate flood occurrence, resist and recover from the impacts of floods. The research also showed that even though both communities lack access to key assets, the respondents at Buipe have a better access to key assets than those at Yapei. Locations of the two study areas do affect their level of vulnerability. The study concludes that the inability of the people to prevent the consequences of flood events is as a result of lack of access to key assets which prevents their ability to anticipate, resist and recover from flood impacts.

We suggest that intervention efforts should be designed to build up the assets of the people. Since the potential scale of future flooding threats [33, 34] exceeds the limited success of major technological interventions in flood prevention [8], some writers suggest that intervention efforts designed to build up the assets of the poor to withstand shocks will be increasingly important to reducing the human burden from flooding [35]. Efforts to build up assets of the people of Buipe and Yapei will help them to withstand shocks and also recover quickly from the consequences of flood events.

Competing Interests

The authors have no competing interests.

Authors' Contributions

All authors contributed equally to this work.

References

[1] National Disaster Management Organization, 2010. Flood statistics for Buipe and Yapei, 2003–2010. Ghana: Buipe.

[2] Tobin GA, Montz BE, 1997. Natural Hazards: Explanation and Integration. New York: The Guilford Press.

[3] World Health Organization, 1999. Emergency Health Training Programme for Africa, WHO/EHA/EHTP. PanAfrican Emergency Training Centre, Addis Ababa.

[4] Ghana Statistical Service, 2000. Population and Housing Census: Summary Report of Final Results. Ghana: Accra.

[5] Ghana Meteorological Agency, 2010. Annual Rainfall Figures for Yapei and Buipe, 2000–2010. Ghana: Accra.

[6] Ghana Statistical Service, 2005. Ghana Living Standards Survey, Series Five. Ghana: Accra.

[7] Changnon SA, Pielke RA, Cnangnon D, Sylves RT, Pulwarry R, 2000. Human Factors Explain the Increased Losses from Weather and Climate Extremes. Bulletin of the American Meteorological Society, 81: 437–442.

[8] Blaikie P, Cannon T, Davis I, Wisner B, 1994. At Risk: Natural Hazards, People's, Vulnerability and Disasters. London: Routledge.

[9] Ford Foundation, 2004. Building Assets to Reduce Poverty and Injustice. New York: Ford Foundation.

[10] Bebbington A, 1999. Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. World Development, 27: 2021–2044.

[11] Moser C, 2006a. Asset Accumulation Policy and Poverty Reduction. http://www.brookings.edu/global/assets06/conference.htm

[12] Moser C, 2006b. Assets and Livelihoods: A Framework for Asset-Based Social Policy. In: Moser C (Ed.), Assets, Livelihoods and Social Policy. Washington, DC: World Bank and Palgrave.

[13] Doss C, Grown C, Deere CD, 2008. Gender and Asset Ownership: A Guide to Collecting Individual Level Data. Policy Research Working Paper, 4704.

[14] Aguilar L, 2004. Climate Change and Disaster Mitigation. Switzerland: IUCN.

[15] Oxfam, 2005. The Tsunami's Impact on Women. http://www.oxfam.org/en/files/bn050326_tsunami_women/download

[16] Nelson V, Meadows K, Cannon T, Morton J, Martin A, 2002. Uncertain predictions, invisible impacts, and the need to mainstream gender in glimate change adaptations. Gender & Development, 10(2): 51–59.

[17] Deere CD, Doss CR, 2006. The gender asset gap: what do we know and why does it matter? Feminist Economics, 12(1&2): 1–50.

[18] Hulme D, Shepherd A, 2003. Conceptualizing chronic poverty. World Development, 31(3): 403–423.

[19] Hulme D, McKay A, 2005. Identifying and Measuring Chronic Poverty: Beyond Monetary Measures. CPRC-IIPA Working Paper, 30. Manchester: Chronic Poverty Research Centre.

[20] Moser, C, 2007. Reducing Global Poverty: The Case for Asset Accumulation. In: Moser C (Ed.). Washington, DC: Brookings Institution Press.
[21] Putnam RD, 1993a. Making Democracy Work: Civic Traditions in Modern Italy. Princeton, NJ: Princeton University Press.
[22] Putnam RD, 1993b. The Prosperous Community: Social Capital and Public Life. American Prospects, Spring, 13: 35–42.
[23] Narayan D, 1997. Voices of the Poor: Poverty and Social Capital in Tanzania. Environmentally and Socially Sustainable Development Studies and Monograph Series No. 20. Washington, DC: World Bank.
[24] Carney D, 1998. Implementing the Sustainable Livelihoods Approach, in Sustainable Rural Livelihoods: What Contributions Can We Make? In: Carney D (Ed.). London: Department for International Development.
[25] Moser, C, 1998. The asset vulnerability framework: reassessing urban poverty reduction strategies. World Development, 26(1): 1–19.
[26] Portes A, 1998. Social capital: its origins and applications in modern sociology. American Review of Sociology, 24(1): 1–24.
[27] Rugadya M, Obaikol E, Kamusiime H, 2005. Critical Pastoral Issues and Policy Statements for the National Land Policy in Uganda. Uganda: Associates for Development, Kampala.
[28] Doss CR, 2006. The effects of intrahousehold property ownership on expenditure patterns in Ghana. Journal of African Economies, 15(1): 149–180.
[29] Mahajan V, 2006. Access to Financial Assets and Economic Opportunities for the Poor: The Strengths and Constraints of Microfinance. http://www.brookings.Edu/global/assets06/conference.htm
[30] Moser C, 1997. Household Responses to Poverty and Vulnerability: Confronting Crisis in Cisne Dos, Guayaquil, Ecuador, Volume 1. Urban Management Program Policy Paper No. 21. Washington, DC: World Bank.
[31] Nethengwe NS, 2007. Integrating Participatory GIS and Political Ecology to Study Flood Vulnerability in the Limpopo Province of South Africa. PhD Thesis. West Virginia University, Geology and Geography Department.
[32] Eldar R, 1992. The needs of elderly persons in natural disasters: observations and recommendations. Disasters, 16(4): 355–358.
[33] Intergovernmental Panel on Climate Change, 2001a. Climate Change 2001: Impacts, Adaptation and Vulnerability, Summary for Policymakers. A Report of Working Group II of the IPCC. In: McCarthy J, Canziani O, Leary N, Dokken D, White K (Eds.), Geneva.
[34] Intergovernmental Panel on Climate Change, 2001b. Climate Change 2001: Impacts, Adaptation and Vulnerability. In: McCarthy J, Canziani O, Leary N, Dokken D, White K (Eds.), Cambridge: Cambridge University Press.
[35] Sanderson D, 2000. Cities, disasters and livelihoods. Environment and Urbanization, 12(2): 93–102.