An Assessment of Attitudes Towards Flood Risk Management in Three Communities at La-Nkwantanang Madina Municipality in Ghana.

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ABSTRACT

While there is evidence of the failure to manage flood risks in several communities in Ghana, previous research has not examined flood risk management in relation to attitudes of state institutions, community and individuals. This study uses a mixed methods research approach involving in depth interviews, focus group discussions, and a survey of 150 household heads to assess differences in attitudes towards flood risk management and the factors that contribute to these differences in Adenta West, Social Welfare and North Legon communities in the La-Nkwantanang Madina Municipality in Ghana. The three communities are exposed to varying levels of flood risk. The findings show that those who live in the high-risk area have a high average positive attitude score towards flood risk management activities. The study found a significant relationship between the attitude of residents to flood risk management activities and the level of flood risk exposure. Positive attitudes towards Flood Risk Management (FRM) increase with the level of flood risk. The level of positive attitude towards FRM activities was estimated to be about 18 percentage points higher for those living in a high flood risk area (Adenta West) compared with those living in a low-risk area (North Legon). Positive attitude to FRM activities is also increasing with previous flooding experience, receiving prior warning about flooding, years of living in the community, and household size. Positive attitude to FRM activities is decreasing with age. Income, gender and years of schooling were not statistically significantly associated with positive attitude to FRM activities. This study contributes to the ongoing effort at building a proactive, inclusive and resilient Flood Risk Management system in order to reduce vulnerability to flood occurrences in Ghana. This study recommends an inclusive, coherent, integrated flood risk management.

KEYWORDS: Flood Risk Management (FRM), flood, flood risk, disaster, attitudes

INTRODUCTION

The concept of modern Flood Risk Management (FRM) began to emerge at the latter part of the nineteenth century as a concept that does not only recognise flood management as an engineering pursuit but also as a social endeavour (Sayers et al. 2013). Risk is defined as the probability of a loss depending on three elements: exposure, vulnerability and hazard (Crichton 1999). Flood Risk Management (FRM) is considered as one of the most effective ways of addressing flood-related issues and it comprises of flood control maintenance activities, floodplain management, protection of flood-prone areas, other flood hazard mitigation activities, and preparation for flood disasters where mitigation activities cannot prevent flooding (Kusi-Appiah, 2016, p. 24). Flood Risk Management (FRM) considers the occurrence of a full range of flood events and the impacts of those events. It as well provides a deeper understanding of the system behaviour (Sayers et al. 2013).

Flood Risk Management (FRM) is an adaptation approach whose goal is to reduce flood risks to individuals and communities, promote economies, promote ecosystem goods and services and promote the social well-being in the events of floods (Sayers et al. 2013). Flood Risk Management (FRM) measures are locally specific, inclusive, integrated and balanced across all stakeholders (Global Facility for Disaster Reduction and Recovery 2012). Flood Risk Management (FRM) practice has moved from a concept that ensures people live with floods to a desire to utilise the floodplain, to a need to control floods to a need to reduce flood damages and finally to the need to manage risk (Sayers et al. 2013). Flood Risk Management (FRM) is considered one of the most effective ways to address flooding and its associated undesirable impacts (Sayers et al. 2013).

Asumadu-Sarkodie, Owusu, & Jayaweera, Herath (2015, p. 201) found that improper management of waste management has a positive correlation with flooding in Accra. The study suggested that the desilting of gutters, river channels, and culverts that are always taken up by solid waste will provide additional storage which will increase the hydraulic performance of drains that will directly reduce peak discharge.

Djimesah, Okine, & Kissi Mireku (2018) examined the impact of flood disaster management on warning systems in Ghana's flooding areas. The study suggested partial least square structural equation modelling (PLS-SEM) to categorize interactions and discover which of the factors had the convincing explanatory power in creating warning systems and by extension, help prioritize managerial activities on flood disaster management in Ghana by applying the Importance-Performance Map Analysis (Djimesah, Okine, and Kissi Mireku 2018).

Flood Adaptation strategies and the influence of attitude on flood risk management activities

The goal of Flood Risk Management (FRM) strategies is to build resilience and adaptative capacity of communities to the adverse effect of flood events (Sayers et al. 2013). In order to reduce the risk associated with flood events, there must be a conscious, inclusive and coordinated effort by all stakeholders. Attitude is a major factor that influences flood management activities (Reynaud, Aubert, and Nguyen 2013).

However, in response to the increasing threat that recurrent flood posses to human life and economic activities, Flood Risk Management (FRM) activities are adopted at the community level, government level and individual level which play a key role in reducing human exposure and vulnerability.

Government level

Amoako (2016) explored the role of city authorities in the reduction of flood vulnerability in selected informal settlements in Accra. The study argued that the vulnerability of human to flood risks in slums in developing countries is greatly impacted by the activities of their city authorities. The study revealed two main strategies of state institutions in Accra's perennial floods. First, being present and complicit in informal urbanization through their involvement in the politics of land management in flood-prone zones; and second, being absent through their inaction in informal growth in flood-risk areas. The study noted that the strategies of government institutions are met with responses from residents and other non-state institutions operating within and outside these communities. The study recommended a re-examination of the current structure and processes of government institutions and state-community engagements in flood-prone communities.

Community level

Adomah Bempah & Olav Øyhus, (2017) examined the factors that influence people's attitude towards the risks they face. The study identified previous experiences, culture and socio-economic status as factors that influence attitudes towards risk. The researchers also examined the issues that influence local people's understanding of National Disaster Management Organization (NADMO), an agency mandated by the government to manage flood-related disasters in their communities.

The study discussed the perceptions, attitudes and behaviours of victims of floods living along the Volta River within the concept of community Flood Risk Management (FRM). The authors argue that past experiences with the local people of Buipe, Nawuni and NADMO were an essential precondition that shaped the way the local people understood the role of NADMO and those experiences influenced the attitudes and behaviours of the community towards Flood Risk Management (FRM) (Adomah Bempah and Olav Øyhus 2017).

Individual level

Amoako, Cobbinah, & Mensah Darkwah, (2019, p. 211) noted that Flood Risk Management (FRM) regime in Ghana has been ineffective due to city planning authorities and government institutions' limited recognition of communities as a complex system. Their study identified four main ways by which urban planning professionals conceptualised urban flooding in Ghana. These are withstanding disasters and emergencies; management of natural resources; adaptive capacity of communities to recover from shocks and social and institutional changes to ensure prevention, preparation and respond to shocks.

Djimesah et al. (2018) recognised the need to efficiently respond to flood-related disaster which is crucial for saving lives and the importance of time and money invested in prevention and preparedness before the event as potential to keep a hazardous event from becoming a disaster in Ghana.

They noted that in order to create a reliable flood warning systems, NADMO needs to educate and involve individual members of the community on Flood Risk Management (FRM). The authors also advise that NADMO hires qualified and experienced staff for efficient and effective Flood Risk Management (FRM). A qualified, experienced and skilful staff coupled with enough resources can transform the Flood Risk Management (FRM) regime of Ghana. The author noted that although there is a need for an effective Flood Risk Management (FRM) system, NADMO lacked the skills and right resources to provide workable policies that can help prevent flood-related vulnerabilities.

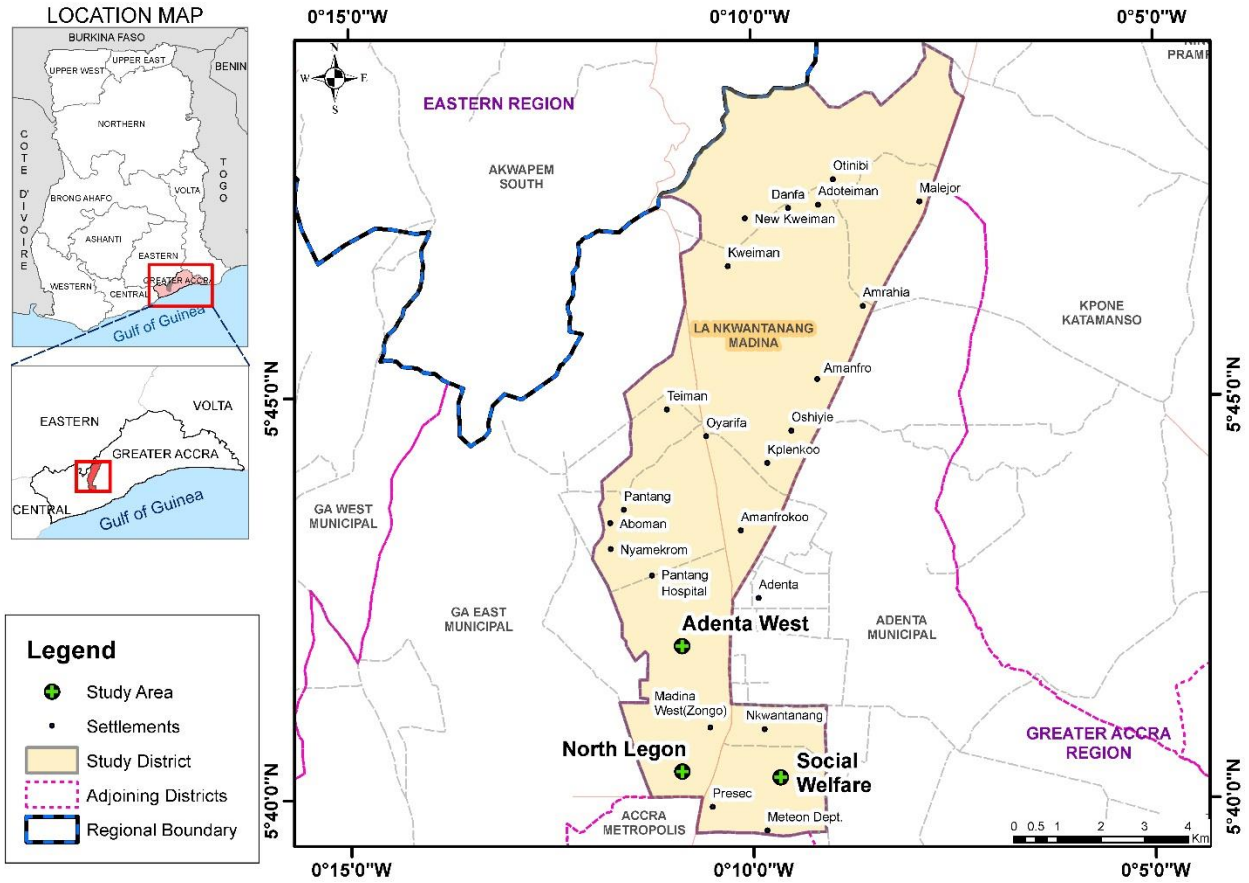

Figure 1: Map of La Nkwantanang–Madina Municipality in Ghana
Source: CERGIS (2019).

Knowledge Gaps

Extensive research has been done in Ghana over the years on flood and Flood Risk Management (FRM). Amoako and Inkoom (2018) explored the conceptualisation of the challenge of flood vulnerability in Accra through an understanding of informal urbanisation. The author made a case for the re-examination of the epistemology and ontology of urban flooding. Abu and Codjoe (2018)explained the relationship between health and flood risk in urban areas.

Adomah Bempah & Olav Øyhus (2017) examined the elements that impact people's attitude and perception towards the risk they face and also examined the issues that affect local people's comprehension of Ghana's National Disaster Management Organization, the government agency responsible for managing disaster and its associated challenges. Amoako, Cobbinah, and Mensah Darkwah (2019) did extensive research on Flood Risk Management (FRM) regimes by government institutions in Ghana. The authors found out that state planning authorities and state agencies' limited realization of urban areas as a complex system was the main cause of the ineffectiveness of state flood management regimes. Djimesah, Okine, and Kissi Mireku (2018) examined and established the impact of Flood Risk Management (FRM) actors on building strong flood warning systems in Ghana.

In spite of these pieces of research, there is gap of knowledge on attitudes towards flood risk management as explained by the action of state institutions, communities and individuals. This shortcoming clearly manifests in the Flood Risk Management (FRM) efforts in the La Nkwantanang - Madina Municipality.

Conceptual Framework

The conceptual framework was developed based on the complex systems theory. Systems consist of three basic parts: the purpose, elements and interconnections (Meadows and Wright 2008). Cities or communities are a set of elements or actors that are joined through a set of interactions (Hudson-Smith et al. 2008).

The purpose of a system shows a system's behaviour as it manifests itself through several activities by revealing the relationship between how information flows from one component to another (Meadows and Wright 2008). Communities or cities as systems are complex because it may exhibit adaptive, dynamic, goal-seeking, self-preserving, self-organising; learning, feedback, communication, and sometimes evolutionary behaviour (Hudson-Smith et al. 2008). Meadows and Wright (2008) understanding and explaining pattern formations of behaviours from interactions in self-organizing and adaptive systems to give the understanding to change and growth.

The complex systems theory suggests that "communities or cities are made of several elements or actors whose interactions shape the future of communities or cities and that any management intervening act should be cognizant of the actions and reactions of the various actors" (Allen 2012). (Amoako, Cobbinah, and Mensah Darkwah (2019, p. 210) explained that the inability to see cities as complex systems is affecting flood management in Africa.

Figure 2 conceptualized flood risk management at three levels: community, individual and government and other institutions. At each of the level, a set of adaptation or mitigation strategies leads to desirable flood management. The singular or coordinated action(s) of these actors in flood risk management leads to a desirable outcome.

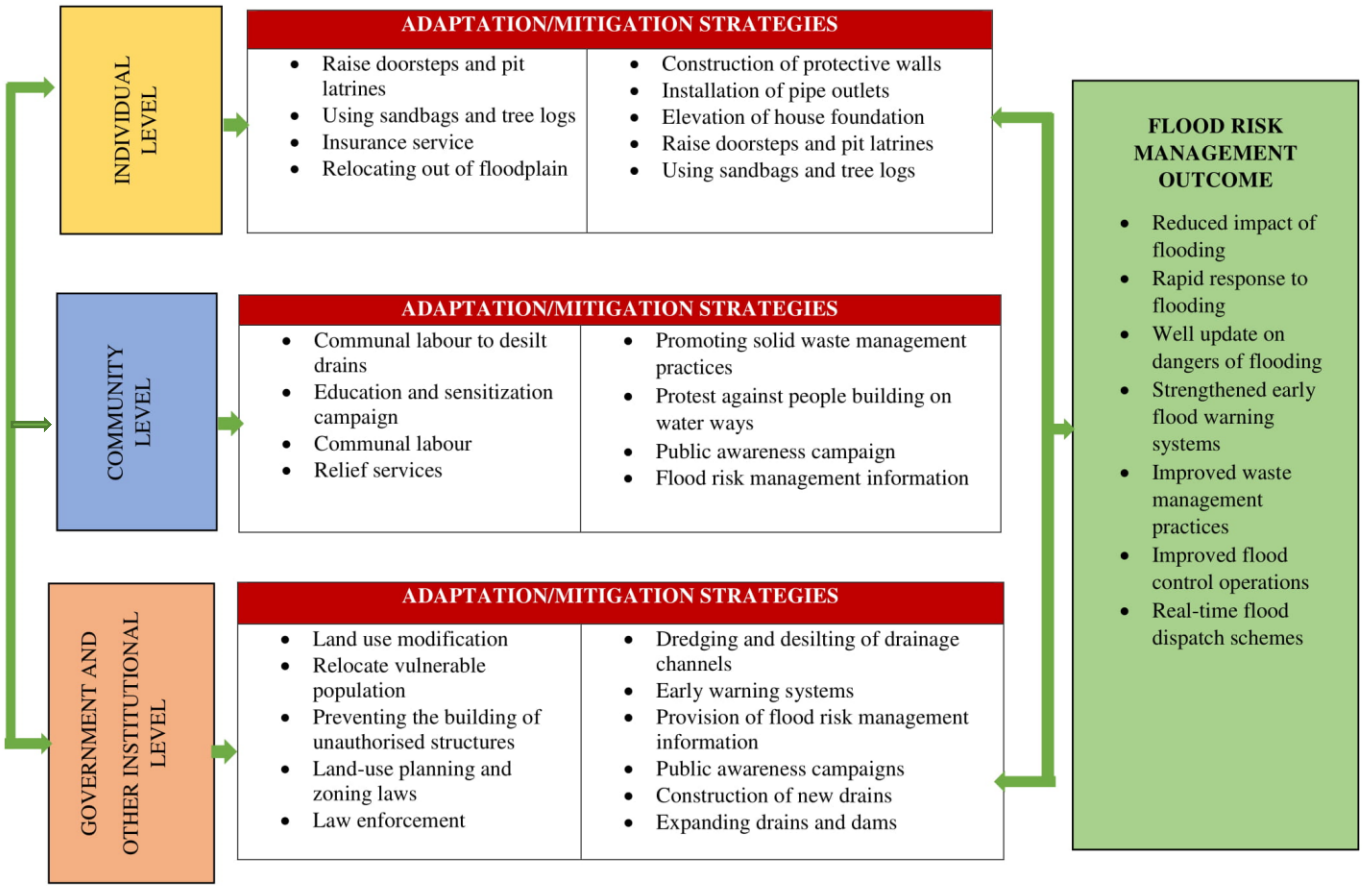

Figure 2: Conceptual framework

Source: Author's own construct, 2019

Model

To examine factors that are associated with a positive attitude towards Flood Risk Management (FRM) activities, the following models are specified.

$$Attitude_i = \alpha + \delta\, Location_j + e_{\mathrm{i}} \quad \text{(Equation 1a)}$$

$$Attitude_i = \alpha + \delta\, Location_j + \gamma\, Flood_i + e_i \quad \text{(Equation 1b)}$$

$$Attitude_i = \alpha + \delta\, Location_j + \gamma\, Flood_i + \beta X_i + e_i \quad \text{(Equation 1c)}$$

where *Attitude* is the dependent variable constructed for individual *i* using five-point Likert scale attitude questions.

The score for each question is divided by 5 and then multiplied by 100 to recast in the percentage scale for easy comprehension. The scores for the six questions are then averaged to produce the overall attitude score which ranges from 10 to 100. $Location_j$ represents community dummies (i.e., North Legon, Social Welfare and Adenta West), with North Legon (the low risk community serving as the comparison community); *Flood* is an indicator variable for flood experience by household *i*; *X* represents a vector of other explanatory variables that are defined in Table 1; α, δ, γ, and β are parameters to be estimated; and e is the random error term. Equations (1a) – (1c) are estimated by Ordinary Least Squares (OLS) regression.

There were a series of questions crafted based on flood lived experience, flood risk perception and willingness to support flood risk management activities to assess attitude to flood risk management activities using the Likert scale. The Likert scale is a set of opinion statements or scenarios which were combined into a single composite score to provide information about attitude to flood risk management activities. It assumes that the intensity of an attitude is linear, i.e. on a continuum from strongly agree to strongly disagree. Respondents rate their level of agreement or disagreement with statements regarding their attitudes towards flood risk management activities on a 5-point Likert scale ranging from (1) strongly disagree, (2) disagree, (3) neutral, (4) agree and (5) strongly agree. A percentage for each option statement was calculated.

Table 1: Description of independent variables

Name of Variable	Representation	Measurement
North Legon (Low risk)	LR	Dummy = 1 if an individual is affected by flood and 0 otherwise
Social Welfare (Medium risk)	MR	Dummy = 1 if an individual is affected by flood and 0 otherwise
Adenta West (High risk)	HR	Dummy = 1 if an individual is affected by flood and 0 otherwise
Affected by flood	$Flood$	Dummy = 1 if an individual is affected by flood and 0 otherwise
Receives warning about the flood	x_{1i}	Dummy = 1 if an individual received flood warning and 0 otherwise
Age	x_{2i}	Continuous
Household size	x_{3i}	Count
Log of monthly income	x_{3i}	Continuous
Years living in the community	x_{4i}	Count

RESULTS AND DISCUSSION

Table 2: Descriptive statistics of respondents' background information.

	Overall	North Legon	Social Welfare	Adenta West	F-Stat	*p*-value
Female	0.56	0.47	0.63	0.53	0.28	
Age	43.1	41.5	45.0	42.1	0.36	
Household size	3.8	3.30	4.03	3.92	0.55	
Years of schooling	12.4	13.6	13.0	11.4	0.01	
Monthly income (GH₵)	1060	1,502	1,056	845	0.04	
Years in the community	11.3	8.17	14.20	10.02	0.01	

Source: author's' construction

Flood Risk Classification of the Study Areas

According to the key informant interview granted by the LANMMA NADMO, flooding is not universal and so are its impact in LANMMA. Sayers et al., (2013), associates the severity of flood risk to the frequency of occurrence, vulnerability to people and the effectiveness and efficiency of Flood Risk Management (FRM) strategies. They describe an area as high to flood risk when the first floor is below sea level, has a history of flooding or close to a water source. According to the Administrator of LANMMA NADMO. This was confirmed by members of the communities.

Attitude Towards Flood Risk Management Activities in the Study Areas

Those who live in high-risk areas have a positive attitude toward Flood Risk Management (FRM) activities (Reynaud, Aubert, and Nguyen 2013). Reynaud, Aubert, and Nguyen (2013) noted flood risk perception, experience or knowledge has the tendency of influencing attitude towards Flood Risk Management (FRM) activities. As was noticed in the research communities, those who lived flood experiences are conscious, determined and motivated to support Flood Risk Management (FRM) activities compared to those who have not experienced floods.

Table 3: Attitude scores towards flood risk management

	Overall	North Legon (Low risk)	Social Welfare (Medium risk)	Adenta West (High risk)	χ^2 *t*-test
Willingness to support FRM	3.0	1.9	3.1	3.6	71.17
	(4.0)	(2.0)	(3.0)	(4.0)	[0.00]
Self-motivation for FRM	3.0	1.9	3.1	3.5	66.1
	(4.0)	(2.0)	(3.0)	(4.0)	[0.00]
Willingness to participate in desilting	3.3	2.0	3.3	4.0	87.9
	(4.0)	(2.0)	(4.0)	(4.0)	[0.00]
Responsible for dredging	3.9	2.4	4.3	4.3	77.1
	(4.0)	(2.0)	(4.0)	(4.0)	[0.00]
Willingness to protest	3.0	4.0	2.2	3.4	63.8
	(2.0)	(4.0)	(2.0)	(4.0)	[0.00]
Willingness to volunteer	3.5	2.3	4.0	3.7	76.4
	(4.0)	(2.0)	(4.0)	(4.0)	[0.00]

Note: the scores range from 1 to 5; Median values in parentheses; p-values in brackets

Table 3 shows statistically significant differences across all locations in the average flood risk management attitude scores. North Legon recorded the lowest average attitude scores, also lower than overall average score, for willingness to support flood risk management activities. North Legon is generally a location for medium and high-income earners. There is evidence of government activities in terms of road construction with drainage systems. The lowest score as compared to the other locations on attitude to flood management activities does not come as a surprise since they are a low-risk area. Adenta West recorded the highest average attitude score towards flood risk management activities. This shows that people who have high risk perception are willing to support flood risk management activities.

The average attitude score on self-motivation towards flood risk management activities was higher in Social Welfare and Adenta than North Legon, as expected. These communities are medium and high-risk areas respectively compared to North Legon. Since they are most affected by flood, they are self-motivated to support flood risk management activities.

North Legon recorded the lowest average attitude score of about two points lower than the overall average attitude score for the willingness to participate in desilting. Since the streets in North Legon are generally clean with clear drainage systems, the low score is not surprising. Comparing this to the other locations, Adenta West had the highest score of 4 followed by Social Welfare. 50 per cent of the respondents strongly disagree to participating in desilting activities for flood risk management whilst more than 60 per cent of respondents in Adenta West agree to participate in desilting activities.

Adenta West, a high-risk area, and Social Welfare, a medium risk area, recorded the highest and similar average attitude score on whether they think they are responsible for dredging. North Legon had the lowest average attitude score. The residents of North Legon believe it is the state's responsibility to dredge drains.

The average attitude score for willingness to protest against building on waterways was lowest in Social Welfare and Adenta West as compared to North Legon. Most of the respondents at Social Welfare and Adenta West have their building on waterways so protesting against building in waterways will mean protesting against themselves.

The average attitude score for willingness to volunteer towards flood risk management activities was highest in Adenta West, the high-risk area, followed by Social Welfare, medium risk as expected. People who are equally exposed to the same level of risk, have a higher cohesion and motivation to supporting each other. That is not the same experience in North Legon which is a low-risk area.

Determination of Attitude Towards Flood Risk Management

The OLS regression results of the determinants of positive attitude towards flood risk management activities corresponds to equation (1a), has location or residence as the only explanatory variable. Results from estimating equation (1b), which controls for flood experience in addition to location of residence is reported in column 2. Finally, column 3 reports the full model, which adds on controls for receipt of warning about flooding as well as demographic and socio-economic characteristics of respondents.

In all three cases, the results show, as expected, that place of residence is a key determinant of attitude towards FRM activities. Residents in the low-risk area (North Legon) had the lowest average positive attitude score while those living in the high-risk area (Adenta West) had the highest average score. The average attitude score for those living in the medium-risk area (Social Welfare) is about 7% points higher than the score for those living in the low-risk area (North Legon); the difference in attitude score between those living in the high-risk area (Adenta West) and those in the low-risk area (North Legon) is approximately 14% points. Table 5 provides the estimated mean attitude scores and the differences between the locations. Mean attitude score for those in the high-risk area (Adenta West) is about 7% points higher than for those in the medium risk area (Social Welfare). All these differences are statistically significant at the 1% level.

Table 4: Mean attitude score towards flood risk management

Dependent variable: mean attitude score (per cent)			
Variables	(1)	(2)	(3)
Residence (Ref. is North Legon–low-risk area)			
Social Welfare (medium risk area)	8.778***	7.673***	6.527***
	(3.097)	(2.435)	(2.446)
Adenta West (high risk area)	17.722***	14.363***	13.520***
	(3.086)	(2.690)	(2.636)
Affected by floods		0.133***	0.151***
		(0.048)	(0.053)
Receives warning about flooding			5.769**
			(2.251)
Female			-0.721
			(1.771)
Age			-0.180**
			(0.091)
Household size			0.856**
			(0.389)
Years of schooling			0.133
			(0.278)
Log of monthly income			-0.845
			(1.167)
Years living in the community			0.228**
			(0.114)
Constant	48.444***	44.379***	46.021***
	(2.824)	(2.449)	(9.069)
Observations	150	150	150
R-squared	0.272	0.308	0.392
F-stat	22.79	21.67	9.93
p-value of F-stat	0.000	0.000	0.000

*Note: ***, **, * represent 1%, 5% and 10% significance levels: Standard errors in parenthesis*

Source: author's' construction

Those who experienced flooding in the past had a statistically significantly higher average attitude score towards FRM than those who have not experienced any floods. This finding is consistent with the literature that when one is affected by flooding, they in turn have a greater personal willingness or responsibility for mitigating flood impact (Werritty 2006). Reynaud et al. (2013) also found a significant relationship between risk perception and behaviour. However, the estimates in table 4.3 shows that the difference in the attitude score is not large (less than a percentage point).

Receiving warning about flooding was found to be significantly and positively associated with positive attitude scores at 5% level of significance. This means that people who receive early warning information about flooding have a higher positive attitude to flood risk management than those who did not receive such information. Parker, Priest, & Tapsell (2009) identified a positive relationship between receiving warning information about flood and mitigation behaviour.

Table 5: Estimated attitude score towards flood risk management

	(1)	(2)	(3)
North Legon (Low risk)	48.44	50.23	51.02
Social Welfare (Medium risk)	57.22	57.90	57.55
Adenta West (High risk)	66.17	64.59	64.55
High risk – Low risk	17.72***	14.36***	13.52***
High risk – Medium risk	8.94***	6.69***	6.99***
Medium risk – Low risk	8.78***	7.67***	6.53***

Source: author's' construction

Household size was found to be significant and positive at 5 per cent. A unit increase in household size increases positive attitude score towards flood risk management activities by about 0.9% points, holding other variables constant. It was found out during the focus group discussion that people who believe they have more to lose are most motivated to support flood risk management activities. This observation agrees with the findings of Bubeck, Botzen, & Aerts (2012) that people undertake flood management measures to reduce the risk they perceive as being high.

Age has a significant negative effect on positive attitude scores at 5% level. On average, a unit increase in age is associated with about 0.2%-point reduction in positive attitude towards flood risk management activities, holding other variables constant. Although Poussin, Botzen, & Aerts (2014) agrees that there is a relationship between age and mitigation behaviour, it disagrees with the findings of the study that the older you are, the less motivated you become towards flood risk management activities. A unit increase in years a resident has lived in a community increase the attitude towards flood risk management activities by 0.2% point, holding other variables constant. It was noticed in the community that those who lived longer in the community are either landowners, live in family houses or have property in the community. These people believe they will lose most when there is flooding.

SUMMARY OF MAIN FINDINGS

Frequent flooding has been the main source of human vulnerability in Ghana (Amoako and Boamah 2015). La-Nkwantanang Madina-Municipality is one of the municipalities affected by flooding as a result of environmental change (Rain et al. 2011). The commonest types of disasters that affect the La-Nkwantanang Madina municipality is flood which is as a result of the presence of silt drains and people building on waterways (La Nkwantanang - Madina Municipal Assembly 2017).

The primary objective of the study was to assess the differences in the attitudes towards Flood Risk Management (FRM), determinants of attitudes towards flood risk management and the factors that account for these difference in Adenta West, Social Welfare and North Legon communities in the La-Nkwantanang Madina Municipality.

Using a structured questionnaire, a total of one hundred and fifty residents of Adenta West, Social Welfare and North Legon communities were interviewed. Qualitative data were used to explain the difference in the risk classification in the study communities and the factors that account for the FRM activities in the study communities.

The study also analysed the determinants of attitudes towards FRM. Results of the analysis shows that the three communities exposed to varying levels of flood risk. Adenta West was classified as a high-risk area, Social Welfare as medium-risk area and North Legon as low-risk area. This was further supported by field observation and reviews of NADMO documents.

It was found that individuals and communities make a difference in flood risk management through their support for flood risk management activities. In Adenta West and Social Welfare, support for flood risk management activities was seen in their communal action whilst in North Legon there was less motivation and support for flood risk management activities.

It was found that those who live in the high-risk area have more positive attitudes to flood risk management activities. Adenta West had the highest positive attitude to flood risk management activities flowed by Social Welfare and North Legon. Thus, the higher the risk of flooding, the higher the average positive attitude score towards flood risk management activities.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions are drawn. For flood risk classification, Adenta West is a low-risk area, Social Welfare is a medium risk area and North Legon is a low-risk area. Individual and community action makes a difference in flood risk management activities. In communities where there is evidence of communal action, there is a lower impact of flooding.

Community members' involvement in flood risk management should be encouraged. This is also because there is a relationship between risk experience and attitude towards flood risk management activities. Those who are affected by flooding have a higher positive attitude score towards flood risk management activities as was seen in the case of Adenta West and Social Welfare.

Future research could be carried out to explore the various dimensions to community flood risk management and how stakeholders' relationships can be harnessed to expand the scope of work and strategy for the purpose of an effective, efficient, integrated flood risk management regime.

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