

Assessment of Flood Risk Perception and Coping Strategies in Flood Prone Areas: The Case of Msasani Bonde La Mpunga, Dar Es Salaam, Tanzania

Fredrick Salukele^{1*} Nsani Yannick Toamukum² Joseph Mayunga²

1. School of Environmental Science and Technology, Ardhi University, P.O. Box 35176, Dar es Salaam, Tanzania

2. Centre for Information and Communication Technology, Ardhi University, P.O. Box 35176, Dar es Salaam, Tanzania

The authors wish to thank Intra ACP – STREAM project for providing the necessary supports and funds in realizing the outcome of this work.

Abstract

In recent years, perception of flood risks has become an important topic to policy makers concerned with flood risk management and safety issues. Knowledge of public risk perception is considered a crucial aspect in flood risk management as it steers the development of effective and efficient flood mitigation measures. The aim of this study is to assess the flood risk perception of residents of Msasani Bonde la Mpunga in Dar es Salaam city and identify the residents coping strategies to flood hazard. The research employed both quantitative and qualitative techniques for data collection using household structured questionnaires and Focus Group Discussions (FGD). Flood awareness, flood experience, degree of worry are the variables used in this study to assess flood risk perception level among residents of Msasani Bonde la Mpunga neighborhood. Results show that flood risk perception was high among the household respondents of Msasani Bonde la Mpunga. Women in particular had high flood risk perception than men. Furthermore, a correlation analysis revealed that flood risk perception had a positive correlation with flood coping strategies, which implies high level of household respondent's perception to floods may lead to household resident's adoption of flood coping strategies.

Keywords: flood risk perceptions, coping strategies, flood risk management

1. Introduction

Flood hazards account for one third of all natural disasters in both developed and developing countries (UNISDR, 2012). In Tanzania and Dar es Salam in particular, flood is the leading hazards that causes wide spread property damage and environmental degradation (OCHA, 2014). This calls for more proactive actions to reduce flood risk through effective flood mitigation measures.

Flood risk perception is defined as the judgments people are bound to make and consider when asked to characterize the hazardous events and activities within their surroundings (Slovic, 2002). These judgments are being shaped by factors such as past experience and encounter with the hazard risk and risk communication activities. It is somehow clear that individuals share different perception on risk; feel differently from one another on a significant issue and underlining causes of different hazard risk (UNISDR, 2009). As a result individuals in a community perceive risk of being flooded very differently. One of the reasons is that they do not have the same information about the probability of flood hazard events in their community. Understanding the human behavior is an important aspect in developing non-structural measures targeting human psychology for managing flood hazard risk. However more needs to be done in the implementation of the knowledge of risk perception in solving flood risk issues. This could be done through the development of flood risk strategies and flood risk communication measures. Unless people are convinced that there is a certain hazard around them with great chances, there is a chance for behaving very reluctant in carrying out mitigation measures (Slovic, 2002). In assessing individual's risk perception and protective actions, greater concerns should be placed on their beliefs, fear and worry about the potential threat for death or injury to themselves and their property.. The aim of this study is to analyze the flood risk perception of residents and identifying their coping strategies to flood hazard. In addition, the study aimed at assessing the relationship between risk perception level and choice of coping strategies implemented by residents in Msasani Bonde la Mpunga.

2. Study area description

The study was carried out in Msasani Bonde la Mpunga, in Dar es Salaam city. Msasani Bonde la Mpunga is a low-lying flat area, situated in Kinondoni Municipality about 6km away from the Dar es Salaam city center. It lies between 0 and 3 meters above India Ocean mean sea level and covers an area of about 120 hectares. According to the 2012 population and housing census, Msasani Bonde la Mpunga had 17,553 people living in the neighborhood with 2,562 households. The 1979 Dar es Salam master plan zoned the area hazardous land which is prone to flood hazards. Initially Msasani Bonde la Mpunga was a wetland area used for paddy farming.

The area started to change from a wetland to a residential commercial housing in mid-1980's (Kiunsi et al., 2009). The current fast development of Msasani Bonde la Mpunga is associated with the presence of planned residential and unplanned residential houses, institutional and commercial proximity to the American Embassy, a private hospital (TMJ), big shopping malls, and residences of former senior government officials. One of the main challenges of Msasani Bonde la Mpunga is uncontrolled housing development which is coupled with poor services and infrastructure. Figure 1 shows the location map of Msasani Bonde la Mpunga.

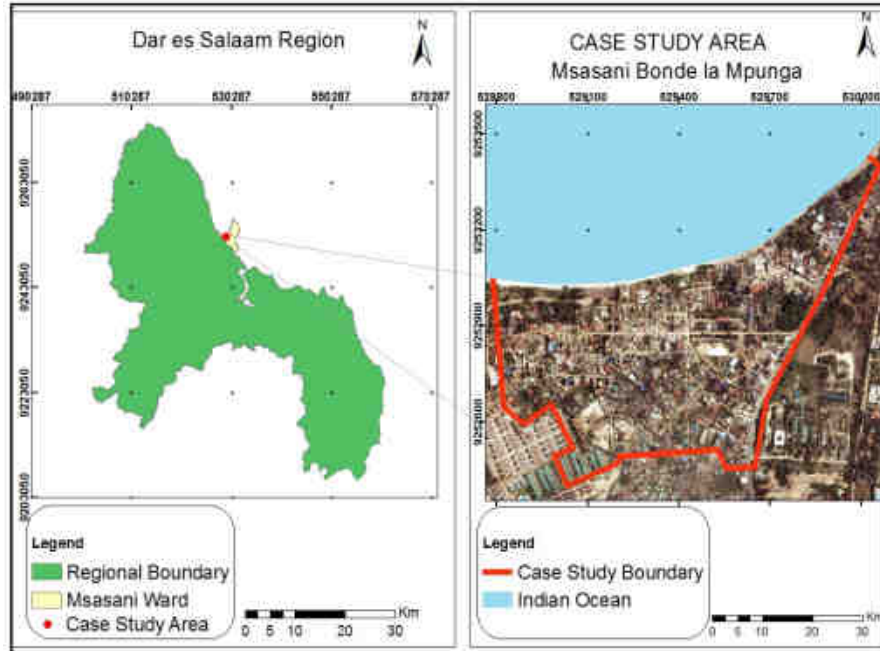


Figure 1: Location map of Msasani Bonde la Mpunga (Source: Google earth image)

3. Methods

The research employed both quantitative and qualitative techniques for data collection using household structured questionnaires and Focus Group Discussions (FGD). In collecting quantitative data, a sample size of 350 households was interviewed using a semi structured questionnaire. FGDs were used to collect information from different groups of residents such as women, youth, and people with disabilities. Flood awareness, experience and degree of worry are the variables used to assess flood risk perception. Economic, social and physical coping strategies were analyzed. Relationship between flood risk perception variables (awareness, experience and degree of worry) and coping strategies of the residents of Msasani Bonde la Mpunga was analyzed. Data analyses were carried out using SPSS software.

4. Results and Discussions

4.1 Flood Risk Perception

Results show that there are high levels of flood risk awareness for women (43%) over men (34%). Flood risk experience is greatly related to historical and past consequences, experienced by individuals. With regards to awareness and experience levels, the percentage of flood awareness (77%) is slightly greater than percentage of flood experience (73%). Results further show a high level of flood experience for women (46%) over men (27%) although in reality men by their nature are involved in more risky activities than women. Botzen et al., (2009) in the analysis of flood risk perception expressed the notion that flood awareness is greatly influenced by the individuals past flood experience. Such experiences are characterized with negative effects and consequences that highlight incidents that shape the minds of the affected persons to be conscious to the existence of the flood hazards around them

The results also presented a high degree (79%) of fear and worry to floods than the awareness and experience variables. Of the 79% of household residents that worry about floods, women had a greater degree of worry (50%) than men (29%). About 21% of household residents do not worry about flood hazards as they have been dealing with flood hazard consequences as part of their daily life. Figure 2 presents the flood risk perception levels analyzed using flood risk perception factors (experience, Awareness, degree of worry and fear)

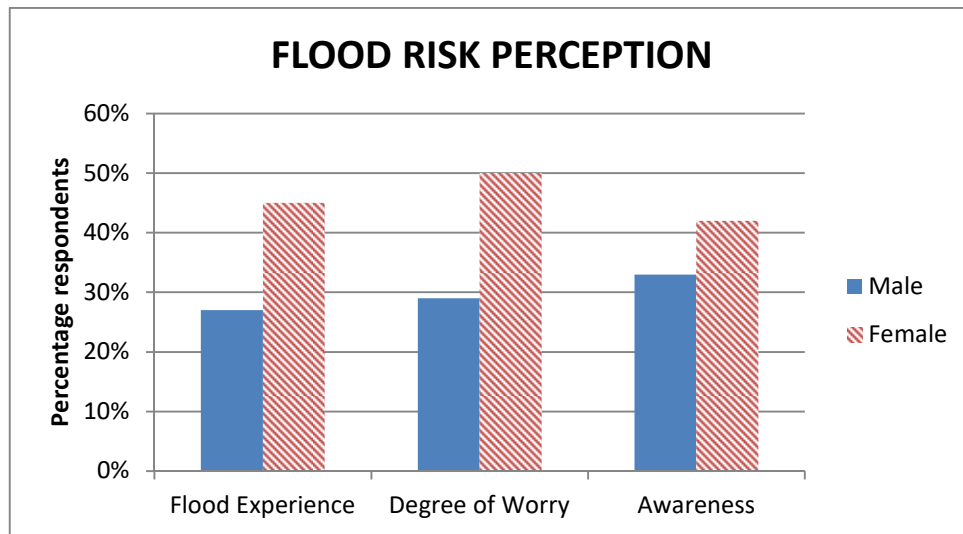


Figure 2: Flood Risk Perception (Source: Field study)

4.2 Coping Strategies

About 68% of the household residents in Msasani Bonde la Mpunga were average-income earners who save very little money for flood mitigation measures. Results show that only 14 % of household respondents reported to have saved some money that may be used in case of any flood event. About 80% of household residents reported that they do not save money for flood risk mitigation measures, as a results they are highly vulnerable to flood impacts.

4.2.1 Economic Coping Strategy

Results show that about 7% of the household respondents reported to withdrawal money from the nearest available mobile money operators e.g., Airtel Money, TigoPesa, Mpesa-Vodacom to support their families following a flood disaster. . Results further show that about 38% of household residents in Msasani Bonde la Mpunga borrow money from friends and relatives to support their families during and after a flood event while 3% borrow from financial institutions. About 9% of household respondents engage in the starting up small trade while 23% of respondents reported to sell extra properties and other electrical appliances.

4.2.2 Physical Coping Strategy

About 30% to 35% of the household respondents agreed to have practiced the physical coping methods of putting sand bags and building of short walls around their houses respectively. About 19% of household respondents reported to use solid doors made up of strong woods, iron and metals that are difficult to be soaked and easily destroyed by floodwater. About 4% of the household respondents reported to engage in immediate rebuilding of flood damaged houses.. It was also reported that majority (42%) of people affected by flood engaged in cleanup activities such as removing of mud remains on furniture and equipment and cleanup of drainage systems.

4.2.3 Social Coping Strategy

The findings show that there is a strong social capital among the Msasani Bonde la Mpunga residents which is developed through networks and connectedness, group associations and membership that people can draw upon to support their livelihoods in time of flood disasters. Household residents pay visits and supports to neighbors who have been greatly affected by floods, offering them with extra food and clean drinking water to cope with floods.

4.3 Relationship between Flood Risk Perception and Coping Strategy

Results in Table 1 show that there is a positive correlation between awareness of flood risk and coping strategies of the respondents in Msasani Bonde la Mpunga ($r = 0.121$, $p \leq 0.05$) This result suggests that an increase in household residents' awareness levels to flood risk will likely lead to an increase in their decision to use flood coping strategies. The findings show that knowledge and awareness of floods is greatly influenced by past flood experience as there is a positive correlation between flood awareness and flood experience of ($r = 0.244$, $p \leq 0.01$)

The study revealed that there is a positive correlation between flood experience and coping strategy ($r = 0.142$, $p \leq 0.01$). This results suggests that as people experience flood, they may likely turn to engage in more coping strategies to minimize the flood damages. When people are faced with severe damages and consequences, they keep a memory that prompts them to stretch out means to take further protective actions in mitigating future

flood damages. The study further revealed that there is a positive correlation ($r = 0.166, p \leq 0.01$) between flood experience and degree of fear. These results show that experiencing floods with serious impacts is likely to create more worry and fear to the household residents which may prompt for an individual to take flood protection actions. The results further show that there is a positive correlation between gender and coping strategies ($r = 0.143, p \leq 0.01$). The results suggest that women show a lot of concern on flood risk and are more likely to engage in various activities to minimize flood damages during and after floods than men. Table 2 presents the relationship between risk perception and flood coping strategies. Results show that there is a positive correlation between houses with children below 12 and flood risk perception ($r = 0.155, p \leq 0.01$). This result suggests that homes with children below 12 years than homes without children below 12 years. Homes with children below 12 years were more worried about flood damages as children stand high chances of being affected by floods. In general, results show that flood risk perception had a positive relationship to coping strategies ($r = 0.129, p \leq 0.05$).

5. Conclusion

Flood risk perception was high among the household respondents of Msasani Bonde la Mpunga. Women in general had high flood risk perception than men. Household respondents practiced less economic measures of floods. Most residents of Msasani Bonde la Mpunga practice physical measures to mitigate floods with the most common being building of short walls around their homes. Socially, the household respondents of Msasani Bonde la Mpunga have strong social capital that which brings sense of togetherness and help each another during floods. Flood risk perception had a positive correlation to coping strategy. This implies that, increase in the household respondent's perception to floods will lead to an increase in the probability of the residents to adopt coping strategies. These findings provide guidance to planners and flood managers on how to effectively manage flood risk in urban poor communities and reduce flood losses. Although this study offers some important insights into the relationship between risk perceptions and coping strategy, these results should be considered as preliminary until further study has been conducted to validate the results.

Table 1: Relationship between Risk Perception and Coping Strategy

	1	2	3	4	5	6	7	8	9	10	11
Gender (1)	1										
Age (2)	.223**	1									
House Ownership (3)	.382**	.178**	1								
ChildrenBelow12 (4)	0.061	0.031	0.003	1							
Elderlyabove60(5)	0.045	-0.065	-0.053	.124*	1						
Disabled(6)	0.087	-0.012	0.009	0.039	-0.059	1					
Education(7)	.140**	0.032	0.011	.167**	0.045	0.017	1				
Flood Awareness(8)	.157**	0.069	0.05	0.047	-0.006	-0.022	-0.016	1			
Flood Experience(9)	-.105*	0.01	0.06	0.083	-0.014	-0.074	-.120*	.244**	1		
Degree of Fear(10)	-.147**	-0.065	-0.082	.176**	-0.058	-0.03	-0.008	-0.018	.166**	1	
Coping Strategies(11)	.143**	0	.115*	-0.05	-0.007	-0.027	-0.075	.121*	.142**	-0.018	1
	0.007	0.997	0.031	0.355	0.898	0.609	0.159	0.023	0.008	0.731	

Table 2: Relationship between Risk Perception and Coping Strategies

	1	2	3	4	5	6	7	8	9
Gender (1)	1								
Age (2)	.223**	1							
House Ownership(3)	.382**	.178**	1						
Children Below12(4)	0.061	0.031	0.003	1					
Elderlyabove60(5)	0.045	-0.065	-0.053	.124*	1				
Disabled(6)	0.087	-0.012	0.009	0.039	-0.059	1			
Education (7)	.140**	0.032	0.011	.167**	0.045	0.017	1		
Risk Perception(8)	-0.05	0.008	0.018	.155**	-0.039	-0.066	-0.077	1	
Coping Strategies(9)	.143**	0	.115*	-0.05	-0.007	-0.027	-0.075	.129*	1
	0.007	0.997	0.031	0.355	0.898	0.609	0.159	0.016	

References

- Botzen, W. and Vasileiadou, E. (2009). Communicating adaptation with emotions: The role of intense experiences in raising concern about extreme weather. *Ecology and Society E&S*.
- Kiunsi, R., Kassenga, G., Lupala, J., Malele, B., Uhinga, G., & Rugai, D. (2009). Mainstreaming Disaster Risk Reduction in Urban Planning Practice in Tanzania.. Retrieved January 2016, from [http://www.preventionweb.net/files/13524_Tanzania final report 27OCT09Mainstrea.pdf](http://www.preventionweb.net/files/13524_Tanzania_final_report_27OCT09Mainstrea.pdf)
- OCHA (2014). Tanzania-Floods OCHA Situation Report No.1. Retrieved November 2015, from <http://reliefweb.int/report/united-republic-tanzania/tanzania-floods-ocha-situation-report-no1>
- Slovic, P., Fischhoff, B., & Lichtenstein, S. (2002). The Psychometric Study of Risk Perception. *Risk Evaluation and Management*, 3-24.
- UNISDR. (2009). Terminology on Disaster Reduction. *International Strategy for Disaster Reduction*. Retrieved September, from http://www.unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf
- UNISDR (2012). Making Cities Resilient Report 2012. *UNISDR*. Retrieved November 2015, from http://www.unisdr.org/files/28240_rcreport.pdf