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COMMUNITY RESILIENCE AND FLOOD RESPONSE STRATEGIES IN NAIROBI'S MAVOKO PERI-URBAN SETTLEMENTS

[1]Jane Njeri Wanjiru and Samuel Kipchoge Kiplagat[2]
[1]Masinde Muliro University of Science and Technology
[2]Masinde Muliro University of Science and Technology

Abstract: The increasing prevalence of peri-urban settlement activities has led to a rise in environmental abuse and flooding, resulting in a growing global concern. Recent events in various countries, including the United States, Australia, Brazil, Pakistan, Scotland, Sri Lanka, and the United Kingdom, have highlighted the multifaceted nature of these challenges. African cities such as Accra, Kano, Kampala, Maputo, and Bujumbura have also witnessed serious flooding, with Nairobi in Kenya experiencing annual inundation during the rainy season. This study explores the management of urban and peri-urban flooding in the context of national disaster policies and response mechanisms, focusing on the case of Nairobi, Kenya.

While some countries have established national disaster and emergency agencies to coordinate responses involving multiple stakeholders, including NGOs and private agencies, Kenya's National Disaster and Management Agency, operationalized through the National Disaster Management Policy of 2004, appears to lack specific provisions for the management of urban floods. Consequently, these events tend to receive delayed responses from the relevant authorities. The response to flood events in urban and peri-urban settlements primarily relies on individual or household-based approaches, often implemented in ad hoc and unsustainable ways.

This research aims to shed light on the challenges and limitations of the existing disaster management framework in addressing urban and peri-urban flooding, particularly in Nairobi, Kenya. It examines the prevailing practices employed by residents to mitigate the impact of floods, such as fortifying their homes with makeshift structures, temporarily relocating to safer areas, and constructing flood barriers. The study also evaluates the role of social actors, including NGOs and private agencies, in facilitating community participation during flood events.

By analyzing the unique dynamics of urban and peri-urban flooding and the shortcomings in the current disaster management policy, this research contributes to a better understanding of the vulnerabilities and resilience of these communities. It underscores the need for tailored strategies and policy adjustments to ensure more effective and sustainable responses to urban flooding events. This study serves as a valuable resource for policymakers, urban planners, and disaster management agencies seeking to enhance their preparedness and response mechanisms for flood events in peri-urban settings.

Keywords: Peri-urban settlement, Urban flooding, Disaster management, Community resilience, Kenya

INTRODUCTION

As peri-urban settlement activities increase, environmental abuse and flooding in these environments are reported to be getting more frequent, complex and multifaceted as illustrated by the recent events in America, Australia, Brazil, Pakistan, Scotland, Sri Lanka and the United Kingdom (Douglas et al., 2008; Jha et al.,2012). African

cities like Accra in Ghana, Kano in Nigeria, Kampala in Uganda; Maputo in Mozambique and Bujumbura in Burund have also witnesses serious flooding (Tucci, 2007; ILGS & IWMI, 2012). Nairobi, in Kenya, has been observed to suffer flooding each rainy season. Some countries have national disaster and emergency agencies to coordinate emergency and disaster response in a multi-agency approach by all stakeholders where social actors such as NGOs and private agecies are increasingly noticeable through community participation (Omondi, 2010). Kenya has the National Disaster and Management Agency, operationalised through the National Disaster Management Policy of 2004 (GoK, 2009). However, in spite of the urban floods getting more frequent and disastrous, their management does not seem to have any special treatment in the National Disaster Management Policy as they take time to attract response from the concerned authorities (IFRC, 2010). Hence, response to flood events urban and peri-urban settlements has mainly been individual or household-based in a variety of ad hoc unsustainable ways (Douglas et al., 2008). These approaches include: Creating high places in their homes using blocks, furniture, stones on which they put valuable items; Temporarily vacating their residence to join family and friends in other safer locations within the affected cities and/or constructing temporary shelters; Moving to central and/or public places such as churches, mosques, chief's palace and other such locations deemed safe; Construction of barriers to prevent ingress of flood water into their houses (Action Aid, 2006).

LITERATURE REVIEW

Many impacts of floods are similar to those of other disasters, but their magnitude, nature and scale may vary with the lives and livelihoods of many poor people hit hardest. The impacts of floods on lives and livelihoods, and the responses thereto by different agencies, are also similar in most parts of the world (ADPC, 2008). Although the humanitarian response by different agencies has been to cover affected people's immediate survival needs over the emergency period, there have been many experiments globally aimed at improving flood risk management, readiness for response and community preparedness. For example, after a survey of South and South-east Asian countries, Alam et al. (2007) reported that where measures for flood risk reduction were an integral part of the overall development process and relief and recovery activities, communities were more prepared to respond when floods occurred. In urban settlements, this entailed the development plans taking into account control of water sources and drainage in flood plains, coupled with non-structural measures from the planning stage with proactive community involvement (Action Aid, 2006). In peri-urban settlements, however, residents develop their own coping mechanisms despite the financial and social constraints with little or no surplus income to invest in the mitigation measures. In this arrangement, members of the local community were able to mobilise logistics for operations such as the search and rescue as was the case following the floods and mud-slide of 2004 in Bangladesh where the initial search and rescue efforts involved community members mobilising local equipment (World Bank, 2005). Residents of these neighbourhoods also rely on social capital such as reciprocal support among neighbours, support from immediate family members and wider kinship networks in coping with flooding (Alam et al., 2007). None the less, this arrangement calls for the creation of functional groups, developing organisational capacities and enabling them to link with the national disaster management mechanisms as effective ways of strengthening preparedness at the community level.

There have also been efforts to address people's critical vulnerabilities to floods and to ensure that the gap between demand and supply of key services such as housing, clean water, sanitation, food, and health is met through adequate preparedness and contingency planning. Provision of temporary shelter for the victims of flooding ensures security and personal safety, protection from the climate and enhances resistance to ill health

and disease (Sphere Project, 2004). It also offers human dignity by having adequate facilities for water and sanitation in addition to sustaining family and community life. Studies conducted world-over regarding flood-shelter report that choice and use of multiple materials and technology did protect people from climatic conditions without adversely affecting the local environment (Oxfam, 2008).

For example, in their report of the "Evaluation of DFID-B Response to Southwest Bangladesh Floods – October 2000–mid 2001", DFID (2001), reported that raising the plinths for flood shelters was an effective flood-proofing measure in South and South-east Asia; while IFRC

(2010) reported that keeping space for livestock in flood shelters was effective in sustaining sources of livelihood in Bangladesh. In community participation, this approach was found to be more effective when homeowner took key decisions, while NGOs and the government supported their decisions with resources and technical inputs (CARE, 2005). It was reported that after the flooding in Maputo (Mozambique), the improvement in the post-flooding houses had a lasting positive psychological effect on the victims (AIDMI, 2007). There is strong evidence that sufficient water supply is critical during flooding, hence the need for rapid delivery of clean water in adherence to water quality interventions, without the risk of increased water-borne diseases (CARE, 2005). Although the need for immediate water provision is often a priority in the critical early stages of response, installation of the supply facilities may be complex, requiring special expertise and time-consuming, slowing response time. From uncoordinated supply deliveries, it has been found that the inconsistent nature of tanked water provision as well as taste acceptability issues resulted in camp residents using untreated surface water (Sphere Project, 2004). There is need for the affected population to know the source and safety of water. Although this may delay response time in the first instance, it has longer-term advantage of community ownership, thus acceptability (Victoria, 2005). However, a study by Smith (2009) revealed that institutional, financial, environmental and social constraints limit water infrastructure services in low-income settings, thus threatening humanitarian access to safe water.

In addition to adequate flood-shelter, effective sanitation is necessary to prevent disease outbreak, hence the need for the excreta to be contained in the quickest time possible to prevent the spread of infections during flooding in peri-urban and urban settlements (IFRC, 2010). The communal latrines used during emergency fill up quickly and become hazardous; as exemplified by Lora-Suarez et al. (2002) who reported an increase in giardiasis among children associated with shared sanitation. Thus, sanitation during flooding is a first line humanitarian concern where a wide range of studies have been conducted, but with no one solution is appropriate for all cases (Wisner & Adams, 2002; Harvey & Reed 2005). Agencies may also be poorly equipped to deal with the rapid provision of pit latrines in urban and peri-urban emergency contexts due to a high water table, concrete sites, or lack of permission. For example, following the 2009 floods in Manila (Philippines), agencies took weeks to construct wooden raised latrines with small holding tanks (Johannessen, 2011; Bastable & Lamb, 2012). Experiments in flood risk management, readiness for response and community preparedness over the last few decades reveal that the effectiveness of agency interventions has always been influenced by factors based on the context and circumstances (CARE, 2005). However, there is little documented evidence of studies carried out in Kenya, or Nairobi in particular, on psycho-social approach to enhance citizens' participation in disaster intervention. It is with this background that this study sought to explore psycho-social intervention measures that would enhance homeowners' response to flooding in the peri-urban settlements of Mavoko in Nairobi metropolis, Kenya.

METHODODOLOGY

Study Site

The research was carried out in the geographical region defined as Mavoko settlement, which covers Mavoko constituency of Machakos County within Nairobi Metropolis. Mavoko settlement was identified for this study because it was considered as forming a special geographical space for academic and practical scrutiny for five reasons. First, the area is a transitional zone between the truly urban Nairobi city and a clearly rural area of Machakos County, hence experiencing rapid socio-economic transformation and environmental challenges related to the emergence of urban activities in rural areas (UN-HABITAT, 2006).

Secondly, the study site poses new institutional challenges for socio-ecological planning and vulnerability assessment arising from the intertwined nature of the rural/urban characteristics; the residents' heavy dependence on and exploitation of the natural resources; and the residents' relationships to environmental changes (Eakin et al, 2010). The third reason was that Mavoko settlement is an integral element of urban systems in spatial, temporal social, economic, functional and planning dimensions, because it and its environment are integral to the growth and operation of the growing Nairobi city (Simon, 2008). Fourth, being at the formative stages of development, the area is a place with the potential for positive change due to the livelihood diversification plus access to services and information that could shape the residents' environmental adaptation (Ricci, 2011). Lastly, the study site is reported to suffer disasters perennially. The area recently suffered mass demolitions of homesteads constructed on illegally acquired land with massive displacement of families; and there occurs flooding every rainy season. The increase in impervious surfaces in the larger Nairobi metropolis will affect local hydrological systems because the area is low lying with a relatively flat surface of poorly draining black cotton soils, exacerbating the residents' vulnerability, thus necessitating better mitigation measures.

Study Population and Sampling

The study targeted heads of household; the general public; community and religious leaders; local government officials; leaders of quasi-government institutions, NGOs, CBOs , NEMA; and officials of the Association of architects and physical planners considered to be stakeholders in disaster management in Nairobi. It used the survey design to generate data for the purposes describing the demographic characteristics of the household heads in Mavoko; and to analyse the relationship between homeowners' environmental attitude and the onset of flooding. It was not easy to determine the exact population size of Mavoko at the time of this study because of the fast growing population. Hence, to determine the number of participant household heads, the study employed John Eng (2003)'s formula for calculating representative multistage random sample size of unknown population size as follows.

$$n = \frac{4z^2_{\alpha/2}p(1-p)}{d^2}$$

Where:

n = the sample size

z = the standard normal deviate relating to the 95% degree of confidence set at 1.96 p = an estimate of the proportion of people falling into the group in which we are interested in the population

d = the proportion of error we are prepared to accept

In this study p = 0.5. (Choosing 50% provided the most conservative estimate of the random sample size). The confidence interval of 95% was estimated to be within 10% of the true value. The multistage random sample size was then given by:

$$n = \frac{4 * 1.96^2 * 0.5(1 - 0.5)}{0.1^2}$$
$$n = 384.16$$
$$n \cong 385$$

This formula gives a number that is an estimate of the absolute minimum, making it necessary to have more respondents to compensate for loss during follow-up or other causes of attrition. John Eng (2003) and Botsch (2011) recommends an addition of 10% of sample size to compensate for persons that the researcher is unable to contact; and further 30% to compensate for non-response. Thus, the sample size for this study was 600 distributed across all county wards in proportion to their population density as illustrated in Table 1.

Table 1: Sample size distribution in Mavoko, Nairobi, Kenya

County Ward	**Pop. Density (No. of people/Km^2)**	**No. of respondents per sub-location**		**Totals**
Athi River	659	Athi River North	101	202
		Athi River Township	101	
Kinanie	43	Kinanie	7	14
		Muthatani	7	
Muthwani	90	Muthwani	10	30
		Katani	10	
		Ngelani	10	
Syokimau/ Mulolongo	1130	Syokimau	177	354
		Mulolongo	177	
TOTAL				**600**

The sampling of the households who participated in this study was done using the multistage random sampling methods in three stages. First, the study used the lottery technique where the settlements were divided into nine (9) administrative sub-locations in the four county wards as shown in Table 1. In the second phase of sampling, the lottery technique was used to sub-divide the sub-location into small clusters. The urbane sub-locations of Athi River North and Athi River Township in Athi River ward; and Syokimau and Mulolongo in Syokimau/ Mulolongo ward with high population density were clustered into courts. The rural-like sub-locations of Kinanie and Mathatani of Kinanie ward; and Muthwani, Katani and Ngalani of Muthwani ward were clustered based on villages. A list of all the clusters (courts and villages) was drawn with the help of the local leaders. The names and/or identification numbers of all the clusters were written on pieces of paper; and the desired clusters were randomly selected by picking the required number of papers. From the area, the study identified 34 courts each from Athi River North and Athi River Township Sub-locations; 54 courts each from Syokimau and Mulolongo sub-locations; and three villages each from the five sub-locations in Kinanie and Muthwani county wards.

The lottery technique was then used to select three (3) households chosen from each of the identified courts and villages. In order to take a random sample, a sample frame in the form of lists of all the household heads in each of the courts and/or villages were drawn with the help of local leaders who acted like gate-keepers. The names and/or identification numbers of all household heads were written on pieces of papers; whereupon the desired sample was selected by picking the required number of papers. This approach was guided by Broer and Titherdge

(2010), who used the sampling strategy to reach the dispersed eco-self-built community projects in the UK to evaluate whether Eco-Self-Built Communities lead to feasible, sustainable and low carbon lifestyles. Similarly, in her study, 'public understanding of and response to climate change in the South of England', Whitmarsh (2005) used this strategy to cover different socio-economic groups within flood-prone and non-flood-prone areas; and different groups within areas with differing levels of exposure to air pollution.

The sample sizes and sampling techniques of other units of measurement and observation in the study population were as shown in Table 2.

Table 2: Study population units, sampling method and sample size in Mavoko, Nairobi, Kenya

Study population unit	Sampling method	Size (N)
Household in Mavoko	Multistage random, Cluster, Lottery	600
General Public in Mavoko	Lottery	8
Ministry of lands officials	Purposive	1
Mavoko Sub-County officials	Purposive	1
Red Cross Officials in Mavoko	Purposive	1
NEMA officials	Purposive	1
Residents Association officials	Purposive	2
Religious leaders	Purposive	2
Professional body of physical planners	Purposive	2
Meteorological department	Saturated	2
Focus Group Discussion	Quota	10 per FGD
Document analysis	Saturated	10
Observation checklist	Saturated	10

This study used non-probability sampling methods to identify interviewees and participants in the FGDs. Purposive sampling was used to select officers of government who head disaster response units as well as managers of quasi-government institutions, non-governmental organizations and community leaders that were to participate in the study.

Data Collection

The study used a methodology that embraces both quantitative and qualitative approaches to collect primary and secondary data. The secondary data collection and review preceded the collection of primary data. A review of existing documents provided background information about, and more insights into, the phenomenon of flooding in urban and peri-urban areas (Mogalakwe, 2006). The search for and collection of secondary information was conducted through exploring official and non-official resources. Official sources included publications and policy documents of the KNBS, UN-HABITAT, IFRC and the meteorological department among others. In order to do an exhaustive document analysis, the study first identified the types of documents available and relevant to the study area, before securing authority for their access. Guided by the Evaluation Review (2009), the researcher compiled the relevant documents with respect to the objectives of the study and talked to the custodians before checking the accuracy of the documents by comparing those that contain similar information. The information

from documents reviewed was then summarised, indicating the type of document reviewed, the way to reference each document and information relating to specific objectives of the study.

Primary data were collected through questionnaire, key informant interviews, focus group discussions and direct observations. The questionnaires were designed to be completed by respondents with minimal or no assistance from the researcher. A total of 600 questionnaires were hand delivered to the sampled households. The respondents were left with the questionnaires to fill in information including the humanitarian support and coping mechanisms during flooding in their neighbourhoods; and about measures to enhance their community's response to flooding. A total of 463 (77.16%) of the questionnaires were returned, which upon scrutinising, 55 questionnaires were discarded because they had not filled in properly.

Key informant interview guides were used to elicit information from officers of government and quasi-government institutions; as well as community and religious leaders to answer the 'how' and 'why' questions for the study to explore differences, inconsistencies and meanings through conversations (Durand, 2009). The interviews provided expert and community opinions about vulnerability of peri-urban settlement communities to flood disasters and the causality factors; effects of flooding on the population; and the mitigation measures. It also gave an in-depth understanding of the intervention measures to enhance the community's response to flooding as informed by professional discourses. Appointment letters and interview guides for face-to-face interviews were hand-delivered to twenty (20) key informants in Mavoko. The proceedings were audio-recorded and written responses from the interviewees in form of handouts obtained. FGDs were used to obtaining in-depth descriptive data on beliefs, perceptions and practices pertaining to the occurrence of, and response to, flooding in Mavoko. The researcher convened two (2) FGD sessions of ten (10) participants composed of two (2) homeowners who participated in the household survey, (two) 2 representative from the church, two (2) elders, two (2) business people, one (1) youth and one (1) woman from within Mavoko in order to explore some of the issues related flooding in the community. One FGD focused on the urbane area of Athi River Syokimau/Mulolongo County ward, while the other focused on the rural-like areas of Kinanie and Muthwani County wards. The FGD guide enabled participants to give information on how homeowners' environmental attitude contributes to the onset of flooding.

The direct observation checklist enabled the researcher to make observations to enrich his understanding of the homeowners' environmental tendencies with respect to the objectives of the study. The observation included noting and recording of events, behaviours and activities related to how community members relate to and care for the environment. It also focused on the extent of flooding and household participation in flood disaster interventions so as to get an in-depth understanding of the local practices.

Data Analysis

The data collected were in both qualitative and quantitative form and were analysed using descriptive statistics, Chi-square, Correlation analysis and Nomothetic evaluation. Qualitative data involved tape recorded and written responses to interviews, proceedings at the FGDs, field notes and summary of document content analysis. After reviewing the works of different qualitative research specialists, the researcher used the nomothetic evaluation method to analyse the data from the FGDs; and transcribed and analysed qualitative data from the other sources using the hierarchical coding procedure as illustrated by Whitmarsh (2005). The responses were ordered and grouped through cross-case analysis before it was transcribed and analysed using the constant comparative method to develop relationships and interrelationships from which themes and patterns about flood disaster

interventions (Occhio, 2003). The issue of validity was addressed by asking a number of interviewees to comment on the analysis. Quantitative data were mainly from closed ended questions in the questionnaires. To determine the association between the homeowners' environmental attitude and the onset of flooding, data were collected on the causes and incidences of flooding in the study area through questionnaires. The study used descriptive statistics to measure demographic characteristics before using the Chi-square to analyse the relationship through the application of the SPSS.

RESULTS

Humanitarian Support and Coping Mechanisms during Flooding In Mavoko

As to whether the respondents had received support from any person or institution during flooding and the responses were analysed and presented as shown in Figure 1 from which, it was observed that 368 (93.9%) of the respondents who experienced flooding had got support from individuals and/ or organisations in the area, while 24 (6.1%) of them said they had not received any support during flooding. A Chi square value $(\chi^2_{1,0.01} = 286.23)$ indicated that there was a significant ($p < 0.01$) variation in the responses . This shows that majority of respondents received support from individuals and institutions during flooding.

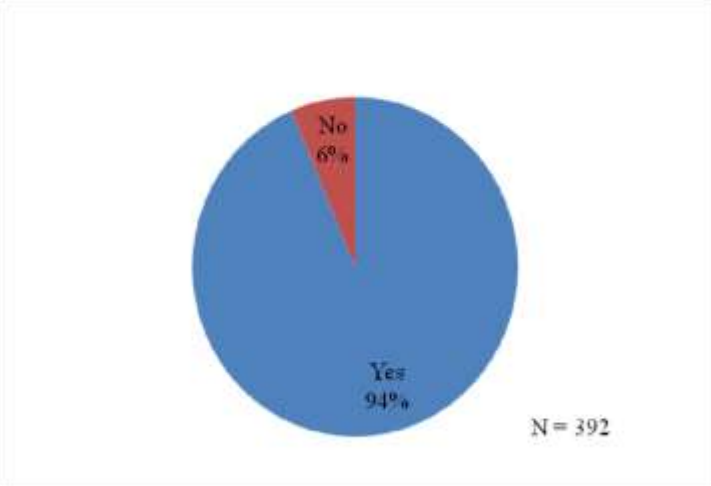


Figure 1: Respondents who received support during flooding in Mavoko, Nairobi, Kenya

Multiple data sources revealed that some people and institutions do offer support to victims of flooding when it occurs. Data from direct observation revealed that when floods come, people called their friends and relatives who brought them some essential supplies of drinking water and food stuffs. In some cases, the friends and relatives picked up and stayed with the victim's children for the entire period of flooding. Proceedings at FGDs and key informant interviews also revealed that flood victims received help from the government and other institutions like churches, mosques, NGOs, CBO and self-help groups. Data from the reviewed literature also revealed support for victims of disasters came from within the neighbourhood through both individual initiatives and organised groupings such as the residents associations and self-help groups (Rahayu & Nasu, 2012; Sigel, 2010). Regarding how satisfied they were with the support given by each of the persons and institutions, the responses were processed and presented shown in Figure 2 from which it was observed that 87.8% of the respondents from the urban-like areas were satisfied with the support given by their relatives and friends from outside, while 86.2% of them were satisfied with support from government. It was also observed that 81.7% of the respondents were satisfied with the support from Churches and Mosques, while 78.5% of them were happy

with the support from NGOs/CBOs. Respondents from the urban-like areas were observed to be least satisfied with the support they got from their individual neighbours (46.2%) and organised neighbourhood groups (36.6%). It was also observed that 85.2% of the respondents from the rural like areas of the settlement were satisfied with the support given by the government, 82.3% were satisfied with the support given by their relatives and friends from outside, while 73.6% of them were satisfied with the support they got from churches and mosques. Further, it was observed that 65.1% of the respondents from the rural-like areas were satisfied with the support given by their individual neighbours, 53.4% were satisfied with the support given by organised neighbourhood groups, while 52.3% were satisfied with the support given by NGOs and CBOs.

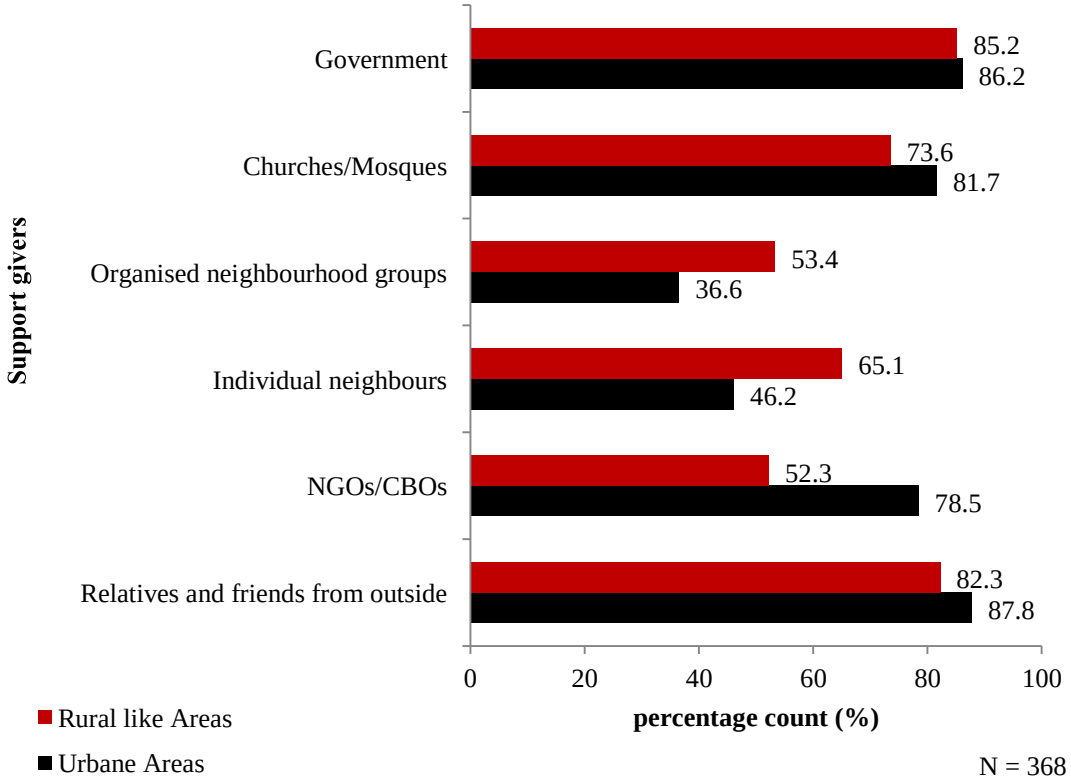


Figure 2: Levels of satisfaction with different support givers during flooding in Mavoko, Nairobi, Kenya

The participants at the FGDs were asked to rank the support givers in the order of how satisfied they were with the support they received from each of them. The Spearman Rank Order Correlation analysis was done to establish whether there were differences in the results from questionnaires and FGDs conducted in urban-like and the rural-like areas of the Mavoko settlement. The rankings are given in Table 3.

Table 3: Ranking of support givers in order of respondent satisfaction in the urban-like and rural-like areas of Mavoko, Nairobi, Kenya

Stakeholder	Urban-like area	Rural-like area
	Questionnaire Ranking	Questionnaire Ranking
Relatives and friends from outside	1	2
NGOs/CBOs	3	6
Individual neighbours	6	3

Organised neighbourhood groups	4	5
Churches/Mosques	5	4
Government	2	1

A Spearman Rank Order Correlation (r) was calculated and the probable error ($P.E._r$) of the correlation also obtained to ascertain if there were differences or similarities in the ranks of the support givers in the urban-like and rural-like areas of Mavoko. The results were as follows:

$r = 0.72 \pm 0.23$; $P.E_r = 0.15$; and $r : 6P.E_r > r > P.E_r$

Therefore, the r value ($r = 0.72 \pm 0.23$) obtained was not significant ($p > 0.05$), meaning that the two rankings varied from each other. Data from multiple sources revealed that the level of and appreciation for support for disaster victims given by individuals and institutions differed in the two setups of the Mavoko peri-urban settlement. Proceedings at the FGDs and key informant interviews revealed a number of issues regarding support for victims of disasters which this study considered as related to attitude. One, victims in rural-like areas were more likely to get support from individual neighbours compared to their counterparts from urbanlike areas due to knowledge of each other or lack of it and mistrust. People from the rural-like neighbourhoods of the settlement were reported to know each other with more trust amongst themselves and for visitors compared to those from the urban-like sections. The second revelation was that the support from government readily came from the Constituency Development Fund (CDF) kitty whose committees were reported to be active at the County ward levels. In addition, government officials are seen to be with the people during emergencies in the highly populated areas of Athi River and Syokimau/ Mulolongo County wards because of the political cost for the elected leaders that would come with inaction from both the county and national governments.

The FGD proceedings also revealed that people did not take personal initiatives towards public good for fear of reprisal from government agencies. For instance, it was observed that a burst water pipe in Athi River Township was left unattended for fear that anyone found fixing the problem would be victimised by the authorities and be charged of vandalism. This makes people fear taking initiatives towards mitigation of flooding such as opening up of road and public drainage systems. The reviewed literature also revealed that support from government and other institutional players for victims of disasters were more available in urban-like areas compared to the rural-like areas of the settlement because two factors. One, as Pharoah (2013) argued, there is likelihood of a high tall of casualties due to the high population density that would exacerbate the spread of waterborne diseases during flooding. The other reason is the high economic loss arising from the destruction occasioned by flooding in these environments (Satterthwaite, 2008).

Measures to Enhance the Mavoko Community's Response to Flooding

Panyako et al. (2015) **reported** that negative environmental attitude among households impeded their support for each other during flooding. Therefore, the study hypothesised that positive environmental attitude among homeowners would enhance their support for the victims of flooding in Mavoko. On how much the respondents agreed with the statements that changing their environmental attitude would improve their support for each other in different ways during flooding, the results presented in Table 4 showed that 300 (98.0%) of them were in agreement that it would improve their support for each other to access work and livelihood opportunities. It was also observed that 291 (95.8%) of them respondents agreed that changing their environmental attitude would

improve their support for each other to access clean drinking water during flooding, 389 (95.3%) of them agreed that it would improve their support for each other to access safe sanitation and toilet facilities, while 390 (95.6%) of them agreed it would improve their support for children to access school during flooding.

Table 4: Humanitarian support enhanced by changing the homeowners' environmental attitude in Mavoko, Nairobi, Kenya

Humanitarian support flood victims	1	2	3	4	5	T/A (%)
To access work and livelihood opportunities	246 (56.1%)	154 (15.7%)	2 (11.8%)	7 (11.5%)	0 (4.9%)	**98.0**
To access clean drinking water supply	187 (41.7%)	204 (50.0%)	3 (2.5%)	6 (4.7%)	2 (1.2%)	**95.8**
To access safe sanitation and toilet facilities	203 (34.8%)	186 (45.6%)	5 (13.0%)	10 (4.2%)	4 (2.5%)	**95.3**
Children to access school	198 (33.1%)	192 (47.1%)	6 (9.6%)	9 (5.9%)	3 (4.4%)	**95.6**

KEY: 1 = Strongly Agree; 2 = Agree; 3 = Not sure; 4 = Disagree; 5 = Strongly Disagree; T/A = Total Agree

A Chi-square test was dine to check the effect of changing the homeowners' environmental attitude on their level of support given to the victims of flooding to: access work places and sources of livelihoods; access to clean drinking water; access to safe sanitation and toilet facilities; access to proper health care facilities; and for children's access to school. The results obtained were as shown in Table 5.

Table 5: Cross tabs of Chi-square tests of the effect of changing the homeowners' environmental attitude on the level of support for flood victims in Mavoko, Nairobi, Kenya

Humanitarian support flood victims	Changing environmental attitude
Access work places and sources of livelihoods	182.92*
Access to clean drinking water	196.78*
Access to safe sanitation and toilet facilities	213.84**
Access to proper health care facilities	469.06**
Children's access to school	1632.0*

KEY:

* = Highly significant at $p < 0.01$

** = Highly significant at $p < 0.05$

From the tabulation, it was observed that changing the respondents' environmental attitude had a significant effect on the level humanitarian support they give to victims of flooding. The value ($\chi_{16}^2{}_{,0.01} > 32.00$) showed that changing the respondents' environmental attitude had a significant effect on their support for children to access school during flooding, as a value ($\chi^2_{16,0.01} > 26.30$) also showed that changing environmental attitude had a significant effect

on the respondents' for the victims to access proper health care facilities during flooding. Similarly, the values ($\chi_{16}^2{}_{,0.01} > 26.30$) showed that changing the respondents' environmental attitude had a significant effect on their

support given for the victims of flooding to access safe sanitation and toilet facilities; to access clean drinking water; and to access their work places and sources of livelihoods when flooding occurred. Multiple data sources revealed that changing the homeowners' environmental attitude would enhance the level humanitarian support for the victims of flooding. Data from direct observation revealed that settlement activities have had an enormous impact on both the physical and social environment in the settlement as homeowners shape it to suit their comfort and perceived needs. It was observed that homeowners in Mavoko had a tendency of engaging in activities such as settling in valleys where they construct perimeter walls that end up obstructing the natural water flow during flooding.

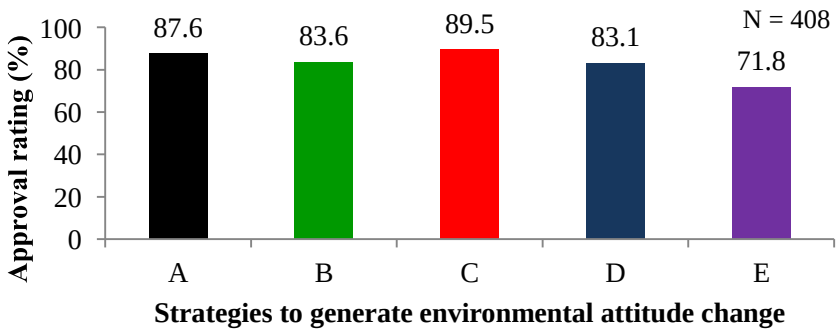
The FGD proceedings at and key informant interviews revealed that homeowners in Mavoko generally lacked concern for each others' welfare, and also seldom exchanged information with neighbours and attended estate meetings. These negative tendencies towards the environment have impeded effective emergency response and humanitarian support amongst neighbours. It was also revealed that the commercialisation of services like water supply had greatly affected its availability and quality during flooding when the prices increased. The FGD proceedings further revealed that there were personality challenges like mistrust, selfishness, introversion as well as lack of conscientiousness and agreeableness among the community members. One participant observed that:

"...we need to be open and receptive to a variety of new pro-environmental ideas…in order to appreciate and support each other during these difficult times."

Data from analysed documents revealed that positive attitude in society enhances emergency aid mobilisation and humanitarian assistance during emergencies. For instance, Swami et al. (2011) reported that agreeableness, conscientiousness and openness were key to environmental engagement across persons and communities in Asia. It has also been reported that positive attitude lead to increased internal locus of control among homeowners who are likely to actively seek out information conducive for positive environmental tendencies (Fielding & Head, 2012). Furthermore, Tang et al. (2011) observed locus of control moderates the link between values and pro-environmental tendencies because it brings out in people a feeling of responsibility with greater willingness to make sacrifices aimed at improving their environment and support for each other during emergencies.

Strategies for Changing Environmental Attitude to Enhance Response to Flooding In Mavoko

Data from the document analyses revealed some of the strategies for changing attitude as: establishing security villages; empowering household members; initiating social inclusion programmes; forming community and volunteer groups; and establishing strong and effective local leadership. Regarding how much the respondents agreed with the statements that these strategies would change their environmental attitude, the results presented in Figure 3 showed that 372 (91.2%) of them agreed that forming community and volunteer groups would change their environmental attitude. It also revealed that 365 (89.5%) of the respondents agreed that initiating social inclusion programmes would change their environmental attitude, while 357 (87.6%) of them agreed that attitude change could be achieved through establishment of security villages. Similarly, it was further observed that 341 (83.6%) of the respondents agreed with empowering individual family members, while 293 (71.8%) of them agreed that establishing strong and effective local leadership would change their environmental attitude.



KEY:

A = Forming community and volunteer groups

B = Initiating social inclusion programmes

C = Establishing security villages

D = Empowering individuals and family members

F = Establishing strong and effective local leadership

Figure 3: Strategies to changing environmental attitude in Mavoko, Nairobi, Kenya

Participants at the FGDs were also asked to rank the strategies for changing homeowners' environmental attitude. A Spearman Rank Order Correlation analysis was done to establish whether there were differences in the results from questionnaires and FGDs conducted in urban-like and the rural-like areas of Mavoko settlement. The rankings are given in Table 6.

Table 6: Ranking of measures to change homeowner' environmental attitude in the urban-like and rural-like areas of Mavoko, Nairobi, Kenya

Stakeholder	Urban-like area Questionnaire Ranking	Rural-like area Questionnaire Ranking
Forming community and volunteer groups	3	1
Initiating social inclusion programmes	5	2
Establishing security villages	1	3
Empowering individuals and family members	4	5
Establishing strong and effective local leadership	2	4

The Spearman Rank Order Correlation (r) was calculated and the probable error ($P.E._r$) of the correlation also obtained to ascertain if there were differences or similarities in the ranks of the strategies for changing homeowners' environmental attitude in the urban-like and rural-like areas of Mavoko. The results were as follows:

$r = 0.47 \pm 0.16$; $P.E._r = 0.10$; and $r : 6P.E._r > r > P.E._r$

Therefore, the r value ($r = 0.47 \pm 0.16$) obtained was not significant ($p > 0.05$), meaning that the two rankings varied from each other.

Chi-square tests were done to determine the effect of the suggested strategies to change homeowners' environmental attitude and the results presented as shown in Table 7.

Table 7: Cross tabs of Chi-square tests of the strategies to change homeowners' Environmental attitude in Mavoko, Nairobi, Kenya

	A	B	C	D	E
Exchange of information amongst neighbours	256.62*	186.97*	129.94*	128.40*	97.72*
Concern for each others' welfare	192.12*	133.83*	160.27**	156.15**	142.69*
Attendance of estate meetings	381.22**	419.36**	127.26**	431.68**	106.27**
Involvement in social activities	769.29**	632.00**	156.21*	893.97*	297.82**

KEY:

A = Forming community and volunteer groups

B = Initiating social inclusion programmes

C = Establishing security villages

D = Empowering individuals and family members

E = Establishing strong and effective local leadership

* = Highly significant at $p < 0.01$

** = Highly significant at $p < 0.05$

Formation of Community and Volunteer Groups and Change of Homeowners' Environmental Attitude

The analysis revealed that formation of community and volunteer groups would significantly change the respondents' environmental attitude. The value ($\chi_{16}^2{}_{,0.05} > 26.30$) showed that formation of community and volunteer groups had a significant effect on the respondents' involvement in social activities in their neighbourhood, while the value ($\chi_{16}^2{}_{,0.01} > 32.00$) also revealed that formation of community and volunteer groups had a significant effect on the respondents' attendance of estate meetings. Similarly, the value ($\chi_{16}^2{}_{,0.01} > 32.00$) further revealed that formation of community and volunteer groups had a significant effect on the exchange of information amongst neighbours; and their concern for each others' welfare. Data from key informant interviews and the FGD proceedings revealed that one of the challenges in Mavoko is that most neighbours do not know each other because many people do come in and move out every month. Therefore, community and volunteer groups such as the residents' associations and self-help groups would help in bringing people together, thereby making them know each other. It was revealed that when people know and understand each other, they develop trust and appreciation for each other's abilities and potential to play given roles during emergencies like flooding. The community groups would also help to spread trusted and reliable information about how best to support each other in the event of flooding. For instance, data from direct observation revealed that most of the Mavoko residents were on social media platforms such as WhatsUp, twitter and instagram. Having all of them hooked up would ensure real time sharing of accurate information, which would in turn enhance flood disaster response.

Data from the reviewed documents also revealed that it is easier for government and other humanitarian agencies support local capacity by identifying community groups and social networks at the earliest opportunity and build on community-based and self-help initiatives (APFM, 2006). Through the community groups, homeowners would develop specific actions required to enhance resilience; and ensure ownership of the intervention for mitigating flooding in the settlement (Jha et al., 2012).

Initiation of Social Inclusion Programmes and Change of Homeowners' Environmental Attitude

The analysis revealed that initiating social inclusion programmes would significantly change the respondents' environmental attitude. The values ($\chi_{16}^2{}_{,0.01} > 32.00$) showed that initiating social inclusion programmes had a significant effect on the respondents' involvement in social activities; on the respondents' attendance of estate meetings; and on the exchange of information amongst neighbours. Similarly, the value $(\chi^2_{16,0.05} > 26.30)$ showed that initiating social inclusion programmes had a significant effect on the respondents' concern for each others' welfare.

FGD proceedings and key informant interviews revealed that a large number of community members would actively participate in community life where reciprocation and trust are developed and they feel a sense of belonging. They also revealed that social inclusion would strengthen the sense of community ownership of the intervention programs because it brings everybody on board. The sense and establishment of a strong cohesive fabric with well developed social capital would be very important to the residents at times of flooding. As observed by a social worker at one of the FGDs:

"...people's unity and togetherness...in one direction and a common goal will strengthen the community and enhance unity...makes it is easier to mobilise local resources in the wake of emergencies."

Data from the reviewed literature also revealed that with social inclusiveness, a strong and positive sense of local identity would develop (Tanner et al., 2009). As reported by Victoria (2005), social inclusiveness has the potential of encouraging community members to adopt common objectives as they work collectively for the common good. In such a way, even physically challenged people with special needs and senior citizens with the community's history would act as resource persons within the community (Johannessen, 2011).

Establishment of Security Villages and Change of Homeowners' Environmental Attitude

The analysis revealed that establishing security villages would significantly change the respondents' environmental attitude. The values $(\chi^2_{16,0.01} > 32.00)$ showed that establishing security villages had a significant effect on the respondents' concern for each others' welfare; and on their involvement in social activities . similarly, the values ($\chi_{16}^2{}_{,0.01} > 32.00$) showed that establishing security villages had a significant effect on the respondents' exchange of information; and on their attendance of estate meetings. Multiple data sources revealed that reasons for the respondents' choice of security villages as an approach to change homeowners' environmental attitude. Key informant interviews and FGD proceedings revealed that establishing security villages would create both an avenue to the general well-being and a sense of belonging in the neighbourhoods. One participant said:

"…security villages will bring about a specific lifestyle for the common good of the residents with the sense of community and unity where people care for each other and their environment."

It was also revealed that the security villages would have a range of communally run facilities like water supply, garbage disposal services, security arrangements and a communication portal brings people together with a common goal of quality lifestyle. With guiding regulations to ensure the services efficiently provided and

amenities conveniently located, there develops a sense of oneness amongst the residents who would effectively support each other during such emergency. One of the residents from Athi River explained that:

"…there should be rules...you will have to live by certain standards ...and if you do not abide by them you will be asked to please leave the estate."

Data from reviewed literature also revealed that establishing security villages would change homeowners' environmental attitude. For instance, Landman (2004) reported that security villages such as gated communities transform urban space from open space to enclosed space where the residents come to know and understand each other making it easier to know of and respond to each other's emergency needs. The security villages also offer full-time security; ensure steady supply of daily requirements uninterrupted; and improves efficiency in the provision of services like garbage collection and storm-water management (Chirisa, 2010). Thus, security villages would be a set of households with programmes to promote proenvironmental tendencies in the Mavoko peri-urban settlement.

Empowering Individuals and Family Members and Change of Homeowners' Environmental Attitude

The analysis revealed that empowerment of individuals and family members would change respondents' environmental attitude. The values ($\chi_{16}^2{}_{,0.01} > 32.00$) showed that empowering individuals and family members had a significant effect on the respondents' involvement in social activities; on their concern for each others' welfare; and on the exchange of information amongst them. Similarly, the value ($\chi_{16}^2{}_{,0.05} > 26.30$) showed that empowering individuals and family members had a significant effect on the attendance of estate meetings. Data from direct observation revealed that due to minor faults, the community has on many occasions been left stranded without provision of essential services like water supply and road drainage. This is because people are not willing to take the initiative for fear of being victimised by the authorities as the cause of the fault. This could not happen if an individual and his neighbour were empowered. Proceedings at FGDs and key informant interviews also revealed that with empowerment, family and community members would learn by their own actions to become fully engaged in shaping their strengths so as to take care of their own environment and support each other during emergencies. As expressed by a pastor during the interview:

"...some of us remain stranded during emergencies until they get assistance from the redcross...we are not able to help each other to overcome the damaging effect..."

Reviewed literature also revealed that empowerment of individual community and family members could promote social interaction among the residents. As reported by Victoria (2005), empowering individual family members makes them active participants in society with enhanced knowledge base. Gibson and Woolcock (2007) observed that using information and communications technologies (ICT) platform, community members are empowered to play an active participant in disaster interventions through improved on early warning.

Establishment of Strong and Effective Local Leadership and Change of Homeowners' Environmental Attitude

The nalysis showed that establishing strong and effective local leadership would change respondents' environmental attitude. The value ($\chi_{16}^2{}_{,0.01} > 26.30$) revealed that establishing strong and effective local leadership had a significant effect on the household heads' involvement in social activities. Similarly, the values ($\chi_{16}^2{}_{,0.01} > 32.00$) also revealed that establishing strong and effective local leadership had a significant effect on the household heads' concern for each others' welfare; on their attendance of estate meetings; and on the exchange of information amongst neighbours. Data from multiple sources revealed that a strong and effective local

leadership would change homeowners' environmental attitude. Key informant interviews and FGD proceedings revealed effective leadership ensures social strength for a community because it promotes unified, flexible and adaptive responses to challenges. Strong and effective leadership was also said to recognise local philanthropists who play leadership roles in the community as instrumental resource persons in developing and promoting pro-environmental values. Document analysis also revealed that effective leadership enhances pro-environmental attitude change in several ways. For instance, Alam et al. (2007) reported that effective leadership can establish and nurtures strong social values such as reciprocal support among neighbours, support from immediate family members and wider kinship networks. Similarly, FOREWARN (2013) also reported that effective local leadership correctly identifies and protects core values of the community; and ensure local capacity building by equipping the homeowners with intellectual, social and technical capacity. Thus, in times of emergency, strong and effective leadership would also ensure the provision of adequate security by harnessing resources to bring about sustainable security in the community (Landman, 2004). Furthermore, effective leadership recognises diversity and ensures the inclusion of all segments of the society taping on the opportunities of divergence which would be harnessed to enhance response to flooding (Victoria, 2005).

CONCLUSION

The analyses in this study revealed that changing the respondents' environmental attitude had a significant effect on the level humanitarian support they give to victims of flooding. The analyses also revealed that establishing security villages, empowering household members, initiating social inclusion programmes, forming community and volunteer groups and establishing strong and effective local leadership had a significant effect of the respondent's participation in flood disaster response and humanitarian support. Therefore, the study concludes that changing the homeowners' environmental attitude would significantly enhance the community's response to flooding in Mavoko. The strategies to change the homeowners' environmental attitude should include: Formation of community and volunteer groups; initiation of social inclusion programmes; establishment of security villages; empowerment of individuals and family members; and establishment of strong and effective local leadership.

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