

Contribution of Risk Sharing Mechanisms in Flood Management and Control in Kilosa District, Tanzania.

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Abstract

The application of risk sharing mechanisms is seen by many in developing countries as a remedy for lessening effects of disasters. However, this notion has not been thoroughly tested in the context of floods in Kilosa District. The focus of this research, was to assess the effectiveness of both formal and informal risk sharing mechanisms, applied in flood management and control, as well to examine challenges confronted the effective operation of them. Four sub-villages were selected for the study in Magomeni and Mbuni Wards. Several methods were used to provide an indication of the performance of the mechanisms. Ninety householders and 10 key informants were interviewed. Field assessment visits, focus group discussions, and a review on archive data were also carried out. Results of the research have revealed four major findings: (i) The local people were aware of the risk sharing mechanisms used in the flood management and control; (ii) only informal risk mechanisms were applied to manage and control floods; (iii) informal risk sharing mechanisms were moderately effective to curb floods; (iv) challenges confronted risk sharing mechanisms were poverty, poor leadership, inadequate education on formal risk sharing, lack of cooperation, inadequate and unequal distribution of reliefs. The study recommends that, the government and others stakeholders should strengthen risk sharing mechanisms education to the community, through the most attainable ways like Village meetings and seminars at Ward and Village levels, better protection of Mkondoa River and other river banks, and that should be soon after offering training to the local leaders on disaster management.

Key words: Flood, Kilosa, Risk, Risk sharing, Risk sharing mechanisms.

1. Introduction

Climate related disasters have been a major source of risks to the poor in developing countries. Many of these disasters have been realized through floods and droughts among others. In recent decades, they have escalated into wide spread deaths and injury of people, environmental destructions, as well as economical losses in many parts of Sub-Saharan Africa (World Bank, 2007; Steitz & Nyangena 2009).

Of these disasters, floods have been the most frequent and devastating with the most frequently recorded destructive events, which accounted for almost 30% of the world's disasters each year (Julie, 2008). The frequency of floods, has been increasing faster than any type of disaster in the planet (Noralene & Rajib, 2008; World Meteorological Organization, 2011). This situation has been caused by the increasing pressure on uncontrolled urbanization, deforestation, and climate change (Bates *et al.*, 2008; Intergovernmental Panel on Climate Change, 2012).

Efforts to reduce human, social, economic, and environmental losses due to floods have been noted to be difficult to achieve, with projections of more intense and frequent floods. Stern's Review estimated that, if no action taken to mitigate floods, damages could cost up to 20% of the global Gross Domestic Product. Failure to implement control measures, could also compound the situation (Stern, 2007).

Moreover, there is a growing recognition that control measures should go hand in hand with flood risk reduction strategies, which aimed to reduce vulnerability and minimize threats to human. Flood risk reduction strategies, are also critical to reduce risk and vulnerability to natural and related technological and environmental hazards. Control measures aims at moderating the adverse effects of floods by reducing vulnerability to flood effects through a wide range of interventions. The use of risk-sharing/transfer mechanisms, is one of the interventions.

Many countries globally, have developed risk sharing mechanisms as tools to manage and control floods. For example, in the United States of America, the Galloway Report produced by the U.S. Interagency Flood Plain Management Review Committee, which was established after the Midwest Floods of 1993 recommended the introduction of cost sharing provisions, for the State and local participation in recovery, response and mitigation activities (Galloway, 1994). In Japan also, the River Law (enacted in 1896, and totally revised in 1964, last amended in 1997) has played an important role in forming the policy for flood management. The River Law assigned the costs related to river administration to the central government for class A rivers, and to prefectural government for class B rivers (Cabinet Office, Government of Japan, 2011).

As for developing countries, especially those in Africa, have been also using risk sharing mechanisms to manage and control floods, though they have been facing challenges in operating them. They are highly vulnerable and the least equipped of all countries to mitigate floods. They have also a limited capacity to spread risk geographically, and their insurance markets are vulnerable to changes in the international markets as well they have underdeveloped non-life insurance markets (Surminski, & Oramas-Dort, 2013).

Furthermore, they lack financial means for adapting to the adverse effects of floods and the capacity to manage the financial risks from the direct impacts of floods, which threatens sustainable development and poverty reduction strategies (GECHS, 2008).

Regarding Tanzania, Morogoro Region has been among of the regions in the country inundated by floods almost every year (European Commission, 2010). Floods have been destroying infrastructures, farmlands, loss of lives, and displacement of people (*Ibid*).

Kilosa District, has been one of the Districts of Morogoro Region which mostly affected by floods (URT, 2005; Maringo, 2014; Ringo *et al.*, 2016). The District, has been subjected to flooding as river Mkondoa has been swollen and burst its banks inundating many parts of the district. This has been causing havocs to people and properties/infrastructures.

In view of the growing magnitude of the problem and the severity of the consequences associated with floods in Kilosa, the government has been put in place numerous efforts to avert the problem. These included the establishment of the displacement camps (temporary settlements), provision of emergency relief and shelter, and water sanitation services (European Commission, 2010; United Nations Children's Fund, 2013; Ringo, *et al.*, 2016). However, the impacts have been still persisting and in some cases they have escalated. In view of this, therefore, exposition of the extent at which risk sharing mechanisms have been crucial tools to enhance resilience of the flood victims in curbing threats inflicted by floods, is deemed necessary, and this paper is a contribution towards it.

In this paper, risk sharing refers to the allocation of costs of taking risks, encompassing bearing the financial and other costs of flood risk management as well explains the shared responsibility of each stakeholder, within the relevant physical, technical, economic and political contexts. In terms of risk sharing mechanisms, it encompasses methods for spreading both the financial and non-financial burdens exacerbated by floods in a given area, over a specified period.

2. Materials and Methods

2.1 The study area

Findings discussed in this study, are based on surveys in four sub-villages of Mbuni (Mbuni A and Mbuni B) and Magomeni (Kiyangayanga, Mbwamaji) which are Wards in Kilosa District (Morogoro Region). Kilosa District is among the Districts in Tanzania where floods have been reported to be on the increase in recent years with devastative havocs on human and properties. The District lies between 6°S and 8°S, and 36°30'E and 38°E, and has semi-humid climate, receiving an average rainfall of 800mm annually while the temperature ranges from 25°C to 28°C (Kilosa District Council, 2010).

The district topographically, is divided into three zones, namely: (i) Flood plain-comprise both flat and undulating plains extending to foothills in the west, with an altitude of almost 550m. Soils are poorly drained, cracking clays in the central parts subjecting to seasonal flooding; (ii) Plateau-situated in the north of the District, with an altitude of 1100m. It has plains and hills and is made up of moderately fertile, well-drained sandy soils which are highly erodible; (iii) Highland-runs from north to the south on the western side of the district, with an altitude of 2200m.

According to URT (2012), the human population of Kilosa District was 438,175 people. Major land uses in the area includes agriculture, wildlife conservation, forest conservation, grazing, and human settlements (Kilosa District Council, 2010).

2.2. Data collection

This study has employed a mix of research methods which include field site visits, key informants interviews, household questionnaires surveys, and focus group discussions. Regarding field site visits, the researcher and field assistants visited the study areas so as to compliment information obtained through other methods of data collection. Issues which were observed were the visible impacts of floods, economic activities, resources available, and types of risk sharing mechanisms.

As for the key informants' interviews, in-depth interviews were held with Kilosa District Disaster Coordinator as well as with Wards and Village Officers. These people were selected because they possessed deep information into the findings. Interviews were guided by the usage of checklists which set up to capture risk sharing mechanisms, the effectiveness of risk sharing mechanisms in flood management and control, and challenges of implementing flood risk sharing mechanisms.

During the survey, focus group discussions furthermore took place. In selecting participants, however, a proportional representation of sex (males and females) as well as age (youths and elders) was taken into consideration. Participants provided valuable insights into the findings pertinent to risk sharing measures which were used to tame floods, contribution of the government and other stakeholders in managing and controlling floods, effectiveness of risk sharing mechanism in flood management and control, as well challenges which were associated with the implementation of the mechanisms.

In addition to focus group discussions, household questionnaire surveys, were similarly used to achieve data. Both open ended and closed ended questions, were administered face to face to 90 respondents in their residents. One field assistant from each Sub-village was used to facilitate data collection. Questionnaires were pretested in each Sub-village to check wording, clarity, lay out, to train field assistants, and to

familiarize them and the study areas. Issues which were encompassed in the questionnaire were the socio-economic aspects of the respondents, flood impacts, available flood risk sharing mechanisms, contribution of risk sharing mechanisms in flood management and control, and challenges impeded them.

2.3 Data analysis and presentation

Collected data were coded and summarized which quantitative data were analyzed by using Statistical Package for Social Sciences (SPSS) 16.0 computer program for windows. Thematic data analysis also was used to analyze qualitative data and they were presented in figures and tables.

3. Results and discussions

3.1 Socio-economic characteristics

The socio-economic characteristics of the population samples for Kiyangayanga, Mbwanaji, Mbumi A, and Mbumi B, are presented in Table 1&2 below. Almost half of the respondents in the total sample (51%; n=90) were males and 49% were females. This could have arisen by a chance. In terms of marital status, 50% were married, 40% singles, 9% widows, and only 1% divorced (Table 1 below).

Table 1: Sex and marital status of the respondents

Sub-villages	Sex of the respondents		Marital status			
	Male	Female	S	M	D	W
Kiyangayanga	55	45	30	55	0	15
Mbwanaji	53.3	46.7	45.7	37.1	2.9	14.3
Mbumi A	50	50	40	55	0	5
Mbumi B	46.7	53.3	45	55	0	0
Total	205	195	160.7	202.1	2.9	34.3
Average	51.25	48.75	40	50	1	9

S=Single, M=Married, D=Divorcee, W=Widow.

As for the ages, less than half of the respondents (46.125%) were aged between 18 and 35 years. This implied that, the economic activities were performed by youths and elders whom were energetic. With reference to education, 41.075% of them had attained primary education and 37.725% secondary education (Table 2 below). This indicated a normal literacy level.

Table 2: Age and education

Sub-villages	Age of the respondents			Education level			
	18-35	36-59	> 60	NF	PE	SE	PSE
Kiyangayanga	30	40	30	10	50	40	0

Mbwamaji	42.9	45.7	11.4	17.1	34.3	48.9	0
Mbumi A	65	15	20	30	40	40	0
Mbumi B	46.6	26.7	26.7	13.3	40	30	0.6
Total	184.5	127.4	88.1	70.4	164.3	158.9	0.6
Average	46.125	31.85	22.025	17.6	41.075	37.725	1.675

NF=Non-formal education, PE=Primary Education, SE=Secondary Education PSE=Post-Secondary Education.

3.2 Risk sharing mechanisms

Findings have revealed that, all surveyed respondents were aware of flood risk sharing mechanisms. Further to that, all of them have disclosed the presence of informal risk sharing mechanisms, which were used to manage and control floods (Figure 1 below). As for the formal mechanisms, it was found out that, people had no interest of them due to lack of education and poverty. This was supported by the argument of the Head of Kiyangayanga Sub-village during key informants’ interview that:

“We do not have education about insurance and other formal risk sharing mechanisms. We even do not know how they are helpful in halting floods. Even if we would be aware, still poverty would hinder us to use them”.

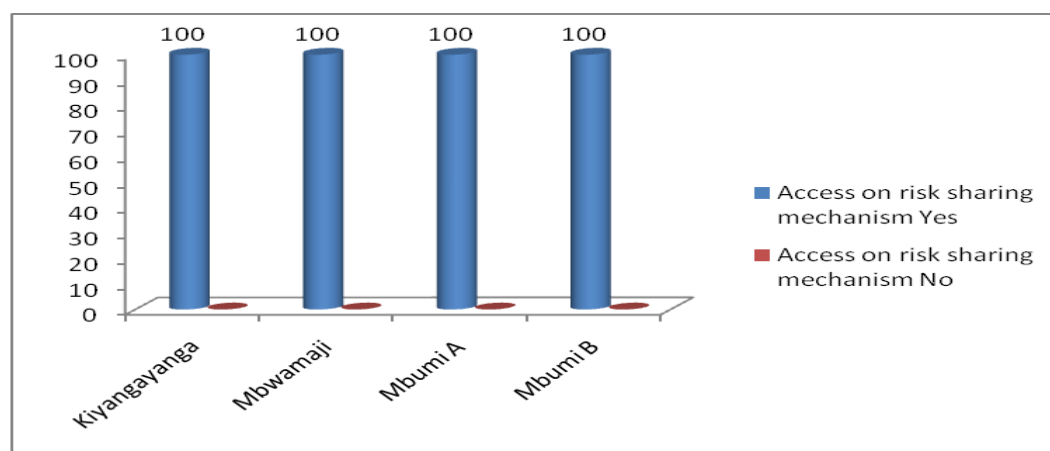


Figure 1: Risk sharing mechanisms.

Regarding the informal risk sharing mechanisms, it was noted that, they were mostly used because they were cost-effective and easily accessible. They encompassed foodstuff items, temporal shelter services, local money borrowing, and building materials (Table 3 below).

Table 3: Types of risk sharing mechanisms

Sub-Villages	Types of risk mechanisms		Informal risks mechanisms		
	Formal	Informal	Food items	Temporal shelters	Building materials

Kiyangayanga	0	100	100	0	0
Mbwamaji	0	100	3	95	0
Mbumi A	0	100	55	25	20
Mbumi B	0	100	34	0	68
Average	0	100	48	30	22

In terms of foodstuff items, 48% of the respondents argued that, they used them to curb food shortage due to floods. Items provided included beans, maize flour, sugar, water guards, and salts among others and they were distributed to flood victims under the supervision of local leaders, in collaboration with stakeholders whom offered them including Red Cross Society, religious institutions (such as SUNNI and Catholic society), private companies (such as CRDB Bank, AL-Saedy Bus Company), individuals as well relatives.

At the village level, findings unveiled that, people in Kiyangayanga had more access to food items than others. This could be due to reasons that, most of them at this Sub-village were poor, a situation which influenced relief providers to concentrate more to them because of the fragile condition which they possessed including lack of basic infrastructures (like resistant houses and roads) and the absence of terraces as well embankments as the researcher observed it during field site visits.

Regarding gender, males were given less foodstuff items than their female counterparts in each Sub-village. More provision of the foodstuffs to females is probably an illustration of the fact that, females in these communities are given priority in issues related to family chores like food issues.

Out of the 30% of the respondents also reported that, temporal shelters were given to the homeless flood victims (Table 3 above), and were accompanied by other items i.e. tents, blankets, mosquito nets, buckets, and jerry cans, water purification tablets, sleeping mats, soaps and mattresses. Stakeholders whom offered these items were World Vision, Islamic Foundation, banks (National Microfinance Bank and CRDB), Al-Saedy Bus Company, Tanzania Social Action Fund (TASAF), Mass Medias (like Star Television, Independent Television and Tanzania Broadcasting Company), United Nations Children’s Fund-UNICEF, and the relatives of the flood victims.

The provision of temporal shelters varied across Sub-villages. Of the four Sub-villages, the access to temporal shelters was more in Mbwamaji. This study has found that, this was because Mbwamaji was in one of the areas where floods exacerbated widespread destruction of roads and houses, as the area lacked terraces and other flood control measures. This was revealed by the argument of the Mbwamaji Chairperson who had this to say:

“The District Council refused to construct terraces in our area by arguing that, we poses poor houses. So, they can not waste money to prevent biscuit houses”.

Results of the research have revealed that, building materials were similarly provided to flood victims. This was disclosed by 22% (Table 3 above) of the respondents whom stated that, they were provided cement, woods, poles, nails, and iron sheets by different stakeholders (Islamic Foundation, Tanzania People’s Defense Forces, Red Cross, World Bank, World Vision, TASAF, Ward, Village and District governments).

Furthermore, it was noted that, people from Mbumi B had more access to buildings materials than other residents, and this could be influenced by the location of this Sub-village, which was geographically close to Kilosa Town. With this background, its residents could have more interactions with institutions at Kilosa Town, hence, influenced easy accessibility of building materials.

3.3 Effectiveness of risk sharing mechanisms to manage and control floods

Respondents had different views on the effectiveness of risk sharing mechanisms in managing and controlling floods. Their views dwelt on the accessibility, affordability, and the capacity of the mechanisms to respond flood risks.

Findings have furthermore revealed that, 52% of them had viewed that the mechanisms were moderately effective. Others, 38% asserted that, they were effective, 5% very effective, and 5% ineffective (Figure 2 below). This means that, many of them felt that, risk sharing mechanisms were effective to manage and control floods. As for those whom perceived the mechanisms were effective, had the views that, risk sharing mechanisms played a great role to tame floods, hence, protected people and increased their resilience against floods.

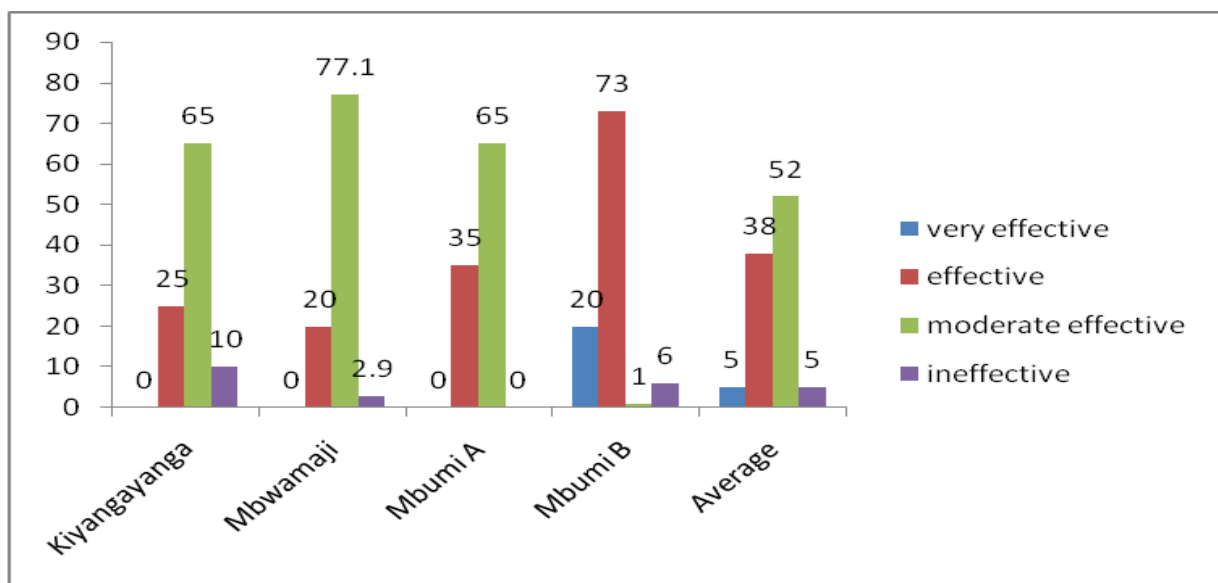


Figure 2: Effectiveness of the risk sharing mechanisms in managing floods.

Furthermore, the range of activities attempted by the local and the central government by including other stakeholders to curb floods in the study area were assessed. Results have showed different activities (Figure 3 below). These involved the constructions of embankments (by Tanzania People’s Defense Forces), rehabilitation and restorations of broken roads and railways (by Kilosa Town Council and Tanzania Railway Limited). However, there were assessment of the damaged infrastructures, planting of trees and reeds alongside Mkondoa river to control erosion (by the Kilosa Town Council and other stakeholders), by providing food, shelter, clothes and medical items to flood victims, construction of temporal houses, and restriction of anthropogenic activities close to Mkondoa river.

Results have further disclosed that, 50% of the respondents reported the construction of terraces and contours, which controlled floods at the steep slopes (Figure 3 below). During field site visits, an embankment along Mkondoa River was observed in Mbumi A and Mbumi B villages.

The embankment was made purposively to block haphazard flows of the water from Mkondoa River to peoples’ residents. As for terraces and contours, they were constructed at the steep slopes to reduce the speed of the water and to control soil erosion.

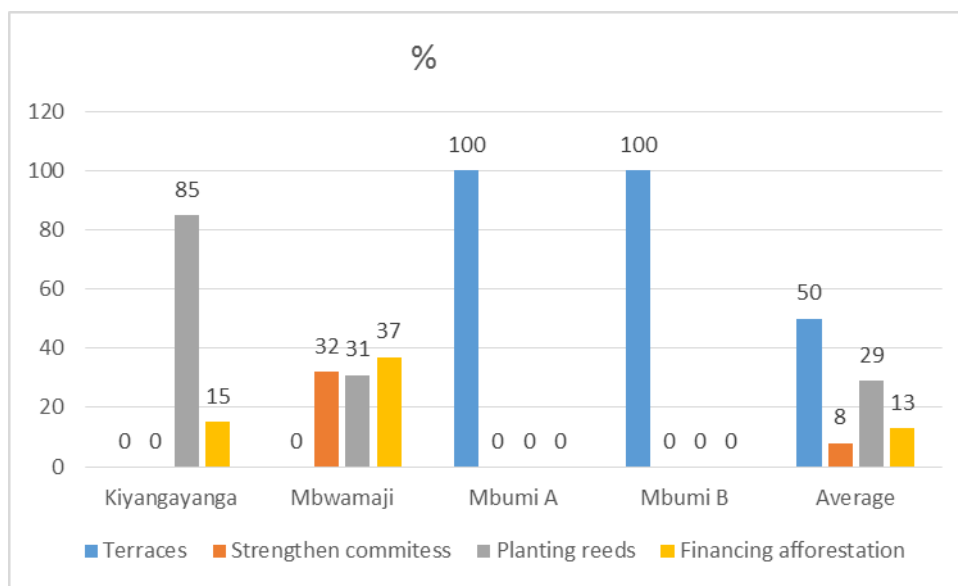


Figure 3: Roles of risk sharing mechanisms.

Results have similarly indicated that, 29% of the respondents stated the plantation of reeds on the contours to control floods at the steep slopes. Elephant grasses, reeds, and sugar canes were also plated in the farmlands along the hill contours, to divert water to the sides of the steep slopes.



Figure 4: Flood control reeds (“*Matete*”) along river Mkondoa banks.

Out of the 13% of the respondents posited that, afforestation was done to control floods. It was observed that, trees were planted on hilly slopes and at the banks of Mkondoa River and other streams. The planting of trees was done by the local residents and private stakeholders including *Mkaa Endelevu* organization, while the afforestation aimed at reducing the velocity of water in the streams, surface run off, and soil erosion.

Nonetheless, some of them had viewed that, the above mechanisms were not effective. They said that, despite of those enthusiastic efforts (like planting of reeds and other trees), effects exacerbated by floods have been escalating and the ensuing consequences were becoming unbearable. Factors such as lack of monitoring and evaluation were identified as the cause of such unsuccessfulness. A Village Chairperson of Kiyangayanga argued:

“Measures taken to ameliorate floods are not active due to inadequate funding from the government and private stakeholders. For this, some measures started and ended up unfinished”.

3.4 Challenges faced risk sharing mechanisms

A number of factors were identified to cause to the unsuccessfulness of risks sharing mechanisms. They include, poverty, lack of cooperation among stakeholders, unequal distribution of aids, relief items, poor leadership, and the lack of education on risk sharing mechanisms (Table 4 below).

Table 4: Challenges hindered operation of risk sharing mechanism

Sub-village	Challenges					
	P	PL	LE	LC	IR	UDR
Kiyangayanga	45	5	15	10	15	10
Mbwamaji	34.3	11.4	2.9	22.9	17.1	11.4
Mbumi A	20	15	10	25	15	15
Mbumi B	46.6	6.7	13.3	6.7	0	26.7
Average	36.475	9.525	10.3	16.15	11.775	15.775

P=Poverty, PLA=Poor leadership, LE=Lack of education, LC=Lack of cooperation, IR=Inadequate relief, UDR=Unequal distribution of relief.

Poverty was revealed by 36.475% of them as a challenge, which hindered the effective implementation of flood risk sharing mechanisms. Among other aspects, it was unveiled that, poverty confronted the provision of risk sharing mechanisms education. Also, it impeded the usage of formal mechanisms such as an insurance. Poverty similarly, pushed people whom failed to help each other due to deprived livelihood. This was supported by arguments of one of the respondents during focus group discussions who asserted that:

“We are all poor, we can not help each other as floods affect all of us. So, everyone has to concentrate on recovery from the impacts by finding assistance from external community as all we are poor”.

Moreover, unequal distribution of relief items was an obstacle which was raised by 15.775% of the respondents. They argued that, leaders lacked transparency in the distribution of relief items. They went far to the extent that, as there was also a favoritism whereby some of the flood victims, did not get the amount/quantity of the allotted relief and some did not completely. Unequal distribution of reliefs left some of the flood victims in hard time to recover the impacts of floods. This was confirmed by the argument of the Village Heads of Mbwamaji during key informants’ interviews that:

“Some leaders are not patriotic, they have been distributing more reliefs to their relatives and friends, sometimes for personal gains and left many flood victims suffer from harsh impacts of floods without help”.

Furthermore, they argued that, reliefs which were offered to them were not enough to satisfy their needs. It was disclosed that, the local government and other stakeholders provided foods and shelters items which meant for temporary recovery. One of the respondents corroborated that:

“The assistance has not been suffice. For example, you are given two pieces of wood and five iron sheets, how will you build or repair a house?”.

This was further echoed by one of the key informants, a representative of the Disaster Management Committee from Kiyangayanga Village that:

“The satisfaction of the aids/reliefs to manage and control floods is moderate but at least, people receive and share a little help which has been provided”.

Moreover, lack of education on risk sharing mechanisms, was another challenge confounded effective operation of risk sharing mechanisms. Respondents revealed that, they lacked education of formal mechanisms like insurance. They did not understand even how to access them. Kilosa District Disaster Management Coordinator disclosed that:

“People lack education about risk sharing mechanisms, especially the formal ones like an insurance. They even did not know how to access them and how they functions in disasters, particularly floods”.

The preceding discussion has shown that, education was associated with the lack of the operation of formal risk mechanisms. This situation could be in place as many of the surveyed respondents were found to have a primary school education (Table 2 above). A few of them had attained secondary school education. Such moderate level of literacy, could have the limited of understanding formal risk sharing mechanisms, such as an index-based insurance, catastrophe bonds, and micro-insurance.

Poor leadership was also contributed to shortfalls in flood risk sharing mechanisms. Respondents blamed the existed local government leaders that, they lacked cooperation with flood victims, they were blamed for being the source of misunderstandings due to their favoritisms and the tendency of using reliefs for personal gains. This was confirmed by District Disaster Management Coordinator that:

“Problems arise between the community and local leaders due to unequal distribution of reliefs and failure, to manage conflicts arise during relief distribution”.

Furthermore, some leaders were reported to be weak to stand for the by-laws enacted to control the activities, which carried a proximity to the banks of the rivers. However, an interview with Mbumi Ward Executive Officer, shoots blames to the local people in repudiating by-laws in place. He put a way forward that:

“Local people should respect by-laws which are in place, and stop pretending that, they do not understand what they have been told or directed by their leaders to stop practicing activities which influenced flooding”.



Figure 5: A poster prohibiting to cultivate or building within 100m from the river and 30m from the railway reserve.

4. Conclusion

Disasters risks are challenging to manage, particularly through formal mechanisms which are often high. Results of the study have revealed that, only informal risk sharing mechanisms were used to manage and control floods. As for the formal ones, they were not in place, partly due to lack of education and poverty. The informal risk sharing mechanisms in place were moderately effective to manage risks exacerbated by

floods. The informal risk sharing mechanisms also were associated with challenges in the study area, emanated from the environmental, political, economic, and social settings.

To make informal risk sharing mechanisms effective, this study suggests that, leaders and members of the disaster management committees, should have a background in disaster management, to have auditing of the aids/reliefs offered to manage floods, local leaders have to be patriot, transparent and ethical in organizing and distributing aids, as well as strengthening cooperation among public and private stakeholders, whom assisted flood victims. Regarding the formal mechanisms, it is suggested that, stakeholders have to invest on educating people about the usefulness of them in curbing flood risks.

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