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# Assessing the effects of flooding on socio economic activities in Jambutu ward, Yola north local government area of Adamawa state, Nigeria

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## ABSTRACT

The study examined the effects of flood disaster on socio-economic activities of residents of Jambutu in Yola metropolitan area of Adamawa State, Nigeria. A sample of 120 households consisting of males and females participated in the study. A questionnaire consisting of six sections measuring demographic variables and impacts of flood on socio-economic status such as agriculture, education, health, housing, water and sanitation was used to collect data. The study established that flood impacted negatively on the socio-economic well-being of residents in the two communities. It is recommended that the government should provide a low-cost housing estate for the flood victims as they have expressed willingness to relocate from the flood prone area so that their children can go back to school as soon as possible. Further allocation of land for residential building in the flood prone areas should be stopped by the government and private land owners. The river banks should be converted to recreation centers and green areas.

## KEYWORDS

evaluation; impacts; flooding; socio-economic; activities

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## INTRODUCTION

Risk associated with flood makes it a requirement to capture information on rainfall pattern and drainage systems. In particular, information on drainage systems and the hydrologic morphometry of any nation is a veritable resource among the core dataset usually captured when producing a topographic map of a country (Bello, Adzandeh and Rilwani 2014). In theory, therefore, flooding or inundation is the excess water above the surface carrying capacity of an area. A situation where water exceeds the normal ground level, flooding is said to have occurred. For example, flooding occurs naturally on the flood plains which are prone to disaster and when water in the river overflows its banks, or sometimes results from a constructed dam (Etuonovbe 2011). Flood impacts on health vary between populations for reasons relating to population vulnerability and type of flood event (Western 1982; Seaman 1984; Malilay, 1997; Hajat et al. 2003; and Ahem et al. 2005). Under future climate change, altered patterns of precipitation and sea level rise are expected to increase the frequency and intensity of floods in many regions of the world (Intergovernmental Panel on Climate Change 2001).

Flood often happens without warning but with a surprise package that always delivers to unprepared community like the ones in most Sub-Saharan African countries. The hurricane Katrina which happened in China is a well feted disaster because several lives and properties worth billions of dollars were lost. The huge human, financial and economic risk associated with most flood plains have made many experts to recommend avoiding such ecologically viable environment to a less vulnerable area especially at it relates to agriculture and habitation activities (Bello, et al., 2013). Factors generally responsible for flooding are numerous. Notable among them are heavy rainfall, blockage of drainage systems, irregular topography, urban encroachment, soil type and geological formations.

A settlement is here defined as an assemblage of buildings with people residing in them. Thus, considering their general makeup, settlements are of major concern when discussing flood hazard. Going by number and economic losses, flood disasters account for about a third of all-natural disasters (Nwilo, Olayinka & Adzanzeh, 2012). Thus, Nigeria is no exception to countries that experienced flooding in recent time. Nigeria like many other coastal countries of the world is blessed with a plethora of drainage systems of varied river morphometry (Bello et al. 2014). Many communities have suffered losses due to flood problem. The 2012 rainy season in Nigeria has been worse than earlier years, and heavy rains at the end of August and the beginning of September led to serious floods in most parts of the country. The frequency of natural disasters has been increasing over the years, resulting in loss of life, damage to property and destruction of the environment. The number of people at risk has been growing each year and the majority are in developing countries with high poverty levels making them more vulnerable to disasters (Living with Risk 2006:6).

Floods occur in many areas of the world. They rank first among other natural disasters in their adverse effects. Areas subjected to floods are equivalent to the total area of all the countries of Western Europe, whose population numbers about one billion (Ward, (1978).

Grunfest (1995) opines that due to high poverty levels, people have become more vulnerable because they live in hazardous areas including flood plains and steep hills. They have fewer resources which makes them more susceptible to disasters. They are less likely to receive timely warnings. Furthermore, even if warnings were issued, they have fewer options for reducing losses in a timely manner. The poverty level affects the resilience and process of recovery from disasters. Disaster mitigation, preparedness and prevention needs to address socio-economic issues not only geological and meteorological aspects.

According to Carter (1991:1), floods have the following characteristics:

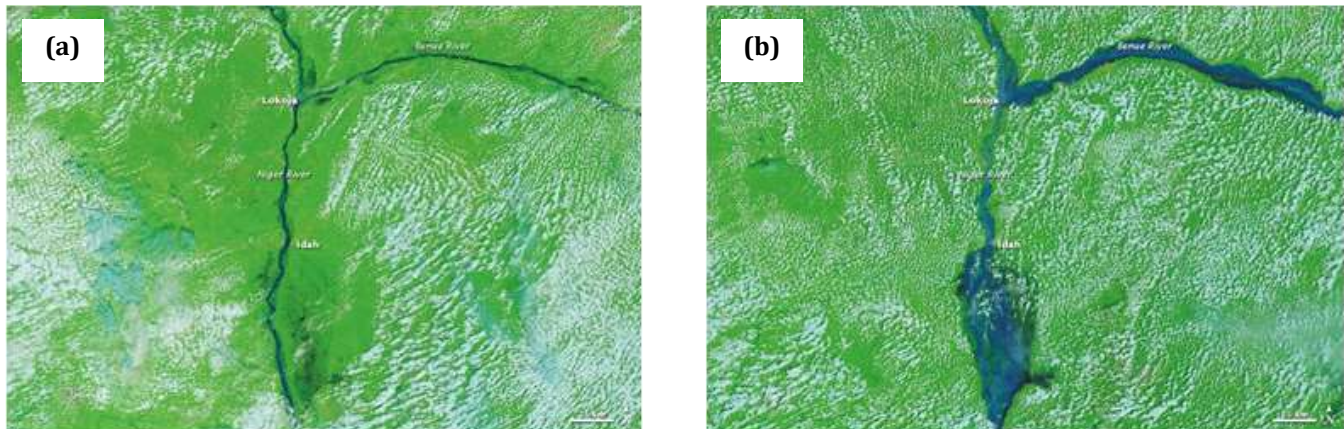
- Long, short and no warning, depending on the type of floods (for example, flooding within parts of a major river may develop over a number of days or even weeks, whereas flash floods give no warning);
- Speed or onset may be gradual or sudden; and
- There may be seasonal patterns of flooding.

Major effects arise mainly from inundation and erosion and may include the isolation of communities or areas and involve the need for large scale evacuation.

Large number of the world's population live on landforms that are acted upon by active fluvial processes such as flood plains and coastal zones with a very wide range of variations e.g. reclaimed or natural wetlands, dune-backed beaches etc. Certainly, such settlements are under threat from erosion and flooding from storm events, streams and river overbank flow etc. The intermittent flood disturbances in most floodplains and coastal areas, as well as flash floods in some metropolitan areas over the years have constituted a major challenge that this study intends to address. The study area is almost every year affected by flood in one part or the other. Specifically, in 2009 parts of Damilu area behind Paterson and Zochonis (PZ) Cussons stores were inundated by floods which destroyed both lives and properties worth millions of Naira.

Another devastating flood affected some areas in Jimeta between August, 25th to October, 10th, 2012. Over 40 days inundation period was recorded, which destroyed lives and properties worth millions of Naira. The flood level as measured on the inundated buildings ranged between 0.1m to 2.2m above ground levels, depending on the distance away from the river Benue and the altitude of the affected sites. The 2012 flood in Nigeria was widely reported to have resulted solely from the release of water from Lagdo dam by the Cameroon (Adamawa State Government, 2012). The effect of the Lagdo dam spillway on the downstream has long been generally believed by the inhabitants as the major cause of Adamawa floods. For instance, Galtima and Bashir (2002) in Nwilo et al. (2012), conducted a study on the people's perception on the causes of flood in Adamawa floodplains, revealed that 58.3% supported the release of the Lagdo dam water as the main cause, while 25% supported the effect of rainfall intensity.

However, the 2012 Adamawa flood was believed to have resulted from the combination of Lagdo dam effect and rainfall intensity as evidenced by the satellite images in Plates 1a and 1b which show the narrow river valleys of Niger and Benue in Nigeria in October 2008 and the wide expansion of the river valleys in the same period in 2012. According to Adamawa State Government (2012), it was this excessive water due to heavy rains that forced the Cameroonian government to open the spillways of Lagdo dam having sent warnings to Nigeria for the release of the water. Moreover, through the Flood Early Warning Centre, Nigeria's Ministry of Environment (2012) issued a forecast of heavy rainfall in mid-September and warned of potential flooding in some parts of the country (Adamawa State inclusive).



**FIGURE 1:** (a) Satellite image of Niger-Benue (Oct/20/2008)  
**Source:** NASA, (2018).

(b) Satellite image of Niger-Benue (Oct/13/2018)

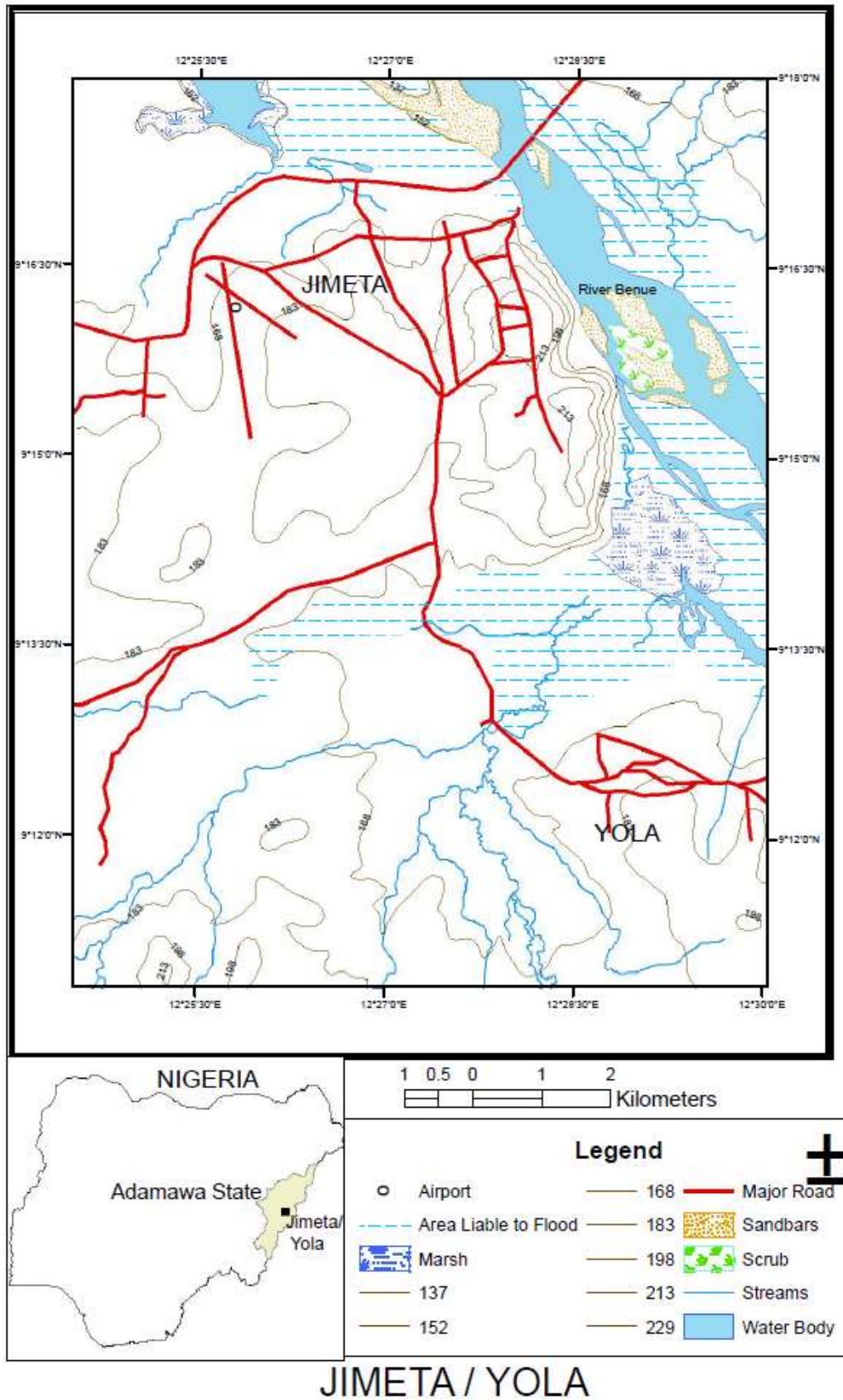
Areas hitherto regarded as safe and suitable for housing development (such as the 80 Units) have intermittently been exposed to various levels of inundation and called to question the wisdom in developing some apparently more risk prone areas. It is therefore most imperative that a rigorous and scientifically determined risk exposure levels are developed to guide policy and development programs in the area of urban growth and expansion and overall development.

In view of the apparent risk people live in, it is perhaps tasking to question where, why and how it happens and find probable solutions to the anticipated flood events.

Which usually affects urban areas that led to loss of lives and properties, displacement of people through loss of shelters, disruption of economic activities and outbreak of diseases and epidemics and lots more. This is what forms the interest of this study that is socio economic effects of flooding in Jambutu ward of Yola North LGA.

#### **MATERIALS AND METHODS**

The study area lies within Benue trough in the central zone of Adamawa state covering an area of 71.085 km<sup>2</sup>. A ward in Yola-North L.G.A, the smallest local government area in terms of land size with land area of about 109 km<sup>2</sup>.



**FIGURE 2:** Map of the Study Area  
**Source:** GIS LAB, Adsu



Yola-North L.G.A. has common boundaries with two local government areas i.e. Girei to the north eastern part, while it is surrounded by Yola-South L.G.A. right from the western border down through the southern part and runs-up to eastern border (Fig. 1.1). It is geographically located between latitude 9o13'30"N and 9o18'30"N and longitude 12o24'E and 12o29'E at the immediate southern bank of the River Benue.

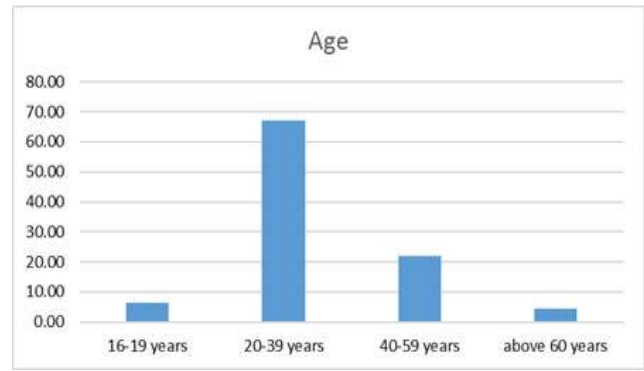
Both primary and secondary sources of data were used for the study. The primary source included questionnaire administration, field observation and interview schedule were employed. Secondary data were obtained from data extracted from topo sheet, SRTM-Digital Elevation maps, newspapers, magazines and journals and other secondary sources. The residents of the study are the target population. Adults aged twenty years and above were the main target. The adults included household heads, chiefs, assemblyman and other opinion leaders. In all, one hundred households were selected for the study because of time and cost constrains.

A multi-stage sampling technique were used. Given the large size of the study area, the first stage involved selecting major areas affected by the annual floods. This was then followed by using random sampling procedure to select households from major areas. Thirdly, a maximum of one respondent was selected from each household and given a questionnaire to answer. The adoption of the simple random procedure was based on the fact that the population is homogeneous in which all members are identical and therefore a sample of one as a representative of the population regardless of the size of the population. The sample size was 120 households in Jambutu ward. The data analysis was mainly based on the data obtained from the questionnaire copies that were retrieved obtained from the respondents. The data obtained was analyzed through the use of descriptive statistics, such as percentage, frequency, table etc.

**RESULTS AND DISCUSSIONS**

**Household Demographics**

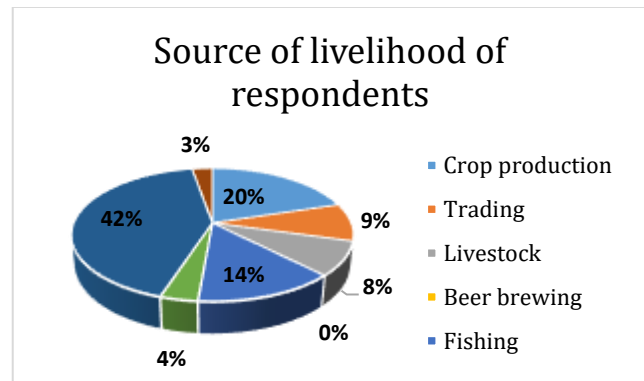
The demographic distributions are such that out of the one hundred and nine (109) households sampled in the survey, 71% were male headed and the remainder (29%) female headed. Furthermore, 67% of the heads of households were married while 17% were widowed. In terms of the ages of the heads of households, the survey findings show that most of them were aged between 20 – 39 years and 60+ years as shown in figure 3 below.



**FIGURE 3:** Analysis on the Age Groups of Household Heads

**Livelihood Patterns**

The research revealed that the first most important livelihood sources for the assessed communities in Jambutu Ward were crop production (23%) followed by trading (11.9%) and fishing (15.6%) (See figure 4 below). Discussions at ward levels established that the main source of income for most households was horticulture followed by crop production and fishing. The main sources of food were found to be own production, followed by casual labour and fishing. The implication is such that since horticulture is the main source of livelihood and food, increased exposure to floods will exacerbate their vulnerabilities by compromising their household food security.



**FIGURE 4:** Comparative Analysis on the Livelihood Types of the Sampled Households

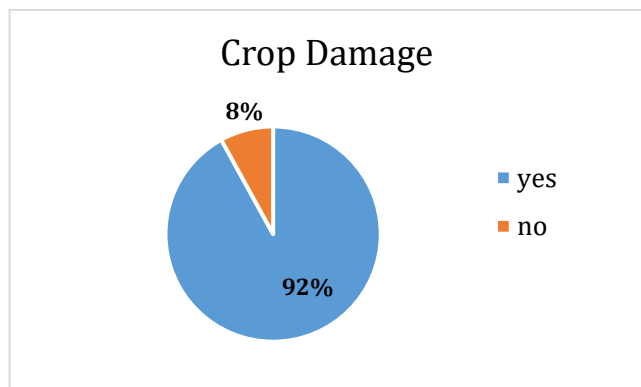
There is clear evidence that the communities in Jambutu ward had very limited livelihood options as most of them indicated to have little or no significant secondary livelihood sources.

The implications are such that the communities will have reduced resilience to floods due to lack of a wide range of livelihood options. Of all the assessed households only

13%, 12% and 12.3% indicated that charcoal burning, horticultural production and trading respectively were the second sources of livelihoods.

**Impact of floods on Agriculture**

Most of the sampled households (92%) indicated that their crop fields were damaged by floods. It was also evident that of the crops which were damaged by floods, most of it (92%) was the main staple crop (maize). This was followed by Sorghum at 29%. Although no data on area planted was collected, it was evident that there was impact on agriculture which is the main source of livelihood and income as discussed under the livelihood patterns section.



**FIGURE 5:** Households that Experienced Crop Damage Due to Floods

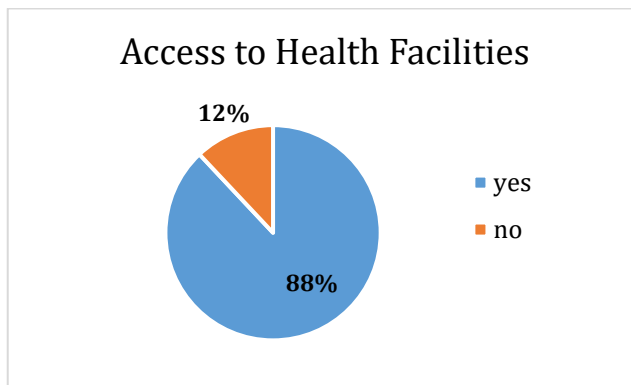
The Implications are such that there will be reduced staple crop production which will result into reduced food availability. This finding has provided better understanding of the vulnerability of the households due to the over dependency on crop production as their main livelihood source. Out of the 109 sampled households, 30% indicated having experienced food stock losses due to floods.

**Impact of floods on Health**

The research revealed that most of the sampled households (88%) indicated that health facilities were available in their communities. Furthermore, very few households (2%) had indicated that health facilities had been damaged by flooding in their communities.

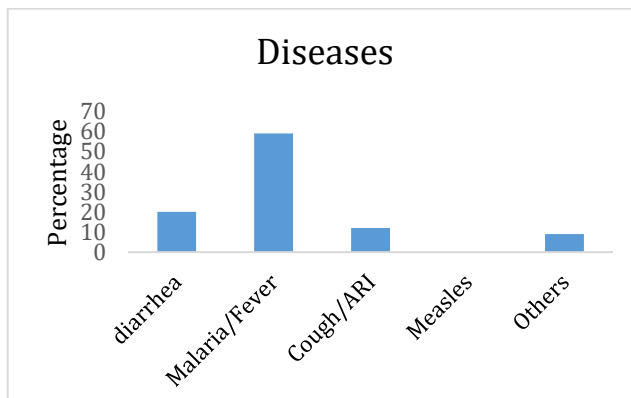
The study found that household heads aged between 20 to 39, 40 to 59 and 60+ experienced disruption in accessing health services as a result of damaged roads and bridges. Disruption in accessing health services implied an increase in disease incidence due to lack access to appropriate medication.

**Access to Health Facilities**



**FIGURE 6:** Access to Health Facilities

The research also revealed that out of the 109 sampled households, 77% indicated having at least one member of their household getting sick during the floods. The most significant diseases experienced among the sampled households were, malaria/fever (65%), diarrhea (21%) and cough/ARI (15%). Furthermore, 8% of the sampled households indicated that they experienced other disease outbreak such as scabies, sores and rash during the floods.



**FIGURE 7:** Distribution of disease experienced

The survey further established that 74% of households whose main source of drinking water was the river had household members falling ill followed by 14% of households who indicated borehole as their main source of water. This means that households will continue to be vulnerable to increased disease outbreak as long as the river continues to be their main source of drinking water. This is as a result of increased contamination that occurs during flooding. Despite borehole being the safest water source for drinking, past vulnerability assessments undertaken within the district have shown that handling of the water by households due to distance to the source has led to increased disease burden such as diarrhea.

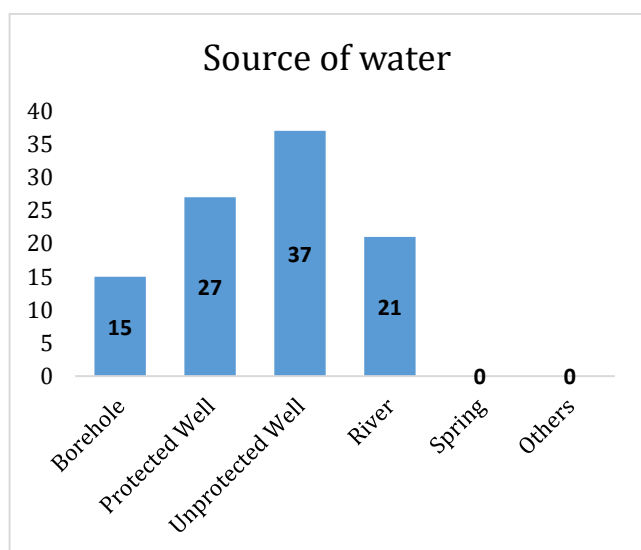
In terms of specific diseases experienced by households due to varying water sources for drinking during the floods, 78% of households whose main source of water was the river experienced diarrhea. Furthermore, 14% of households whose main source was borehole experienced diarrhea. In addition, 74% of households whose main source of drinking water was river suffered from malaria/fever while 14% of households whose main source of drinking water was bore suffered from the same disease. The study further established that 66% of households whose main source of drinking water was river suffered from cough while 20% of households whose main source of drinking water was bore hole experienced the same disease.

**Impact of floods on Education**

All the sampled households indicated availability of education facilities in their communities. Furthermore, 17% of the sampled households indicated that school infrastructure was damaged due to floods in one way or another. The study showed that 38% of the sampled households indicated that school going children experienced disruption due to floods. The disruption was attributed to various reasons such as road being impassable (32%) and school being submerged (9%).

**Impact of floods on Water and sanitation**

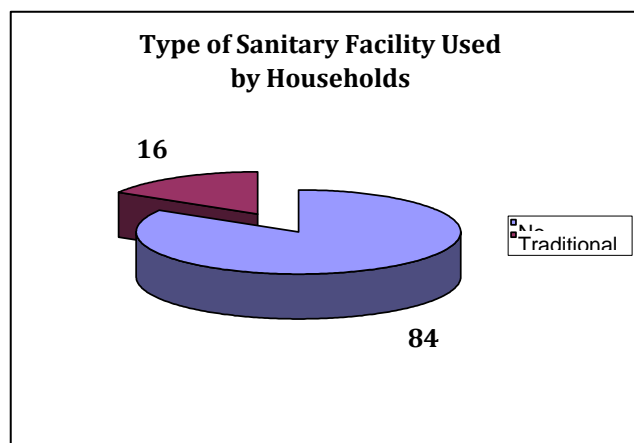
The sampled communities showed a lot of diversity on the type of drinking water sources they had. It was evident that unprotected, protected well and river were the most common water sources that communities used for drinking (see figure 8 below).



**FIGURE 8:** Most common water sources for drinking for sampled Households

The survey established that 37% of the households indicated that their main source of drinking water was the unprotected well followed by protected well and river at 27% and 21% respectively. Furthermore, among the sampled households, 73% indicated that their common water sources for drinking were affected by floods.

In terms of sanitary facilities, 84% of the sampled households had no sanitary facilities (i.e. using bush and rivers as alternatives). It is worth noting that bush and river in the context of sanitation are usually regarded as no sanitary facility even though they are used as alternatives for excreta disposal.

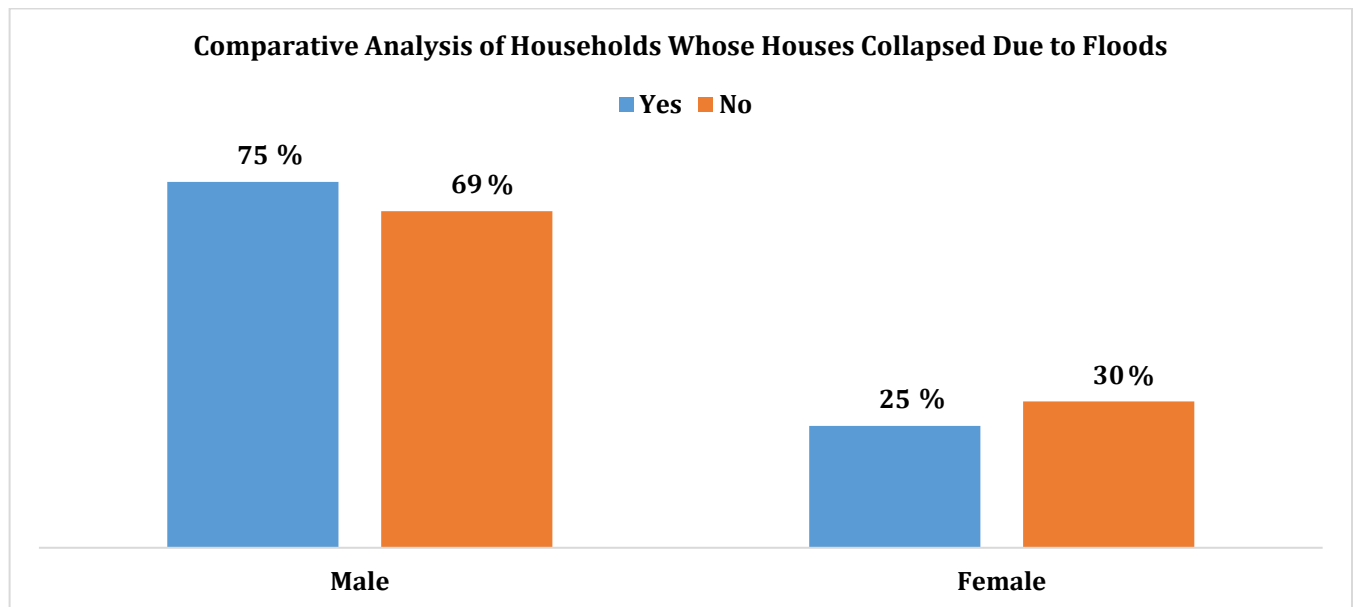


**FIGURE 9:** Type of sanitary facilities used by sampled households

Within the households that indicated having sanitary facilities, 12% had indicated that their facilities were damaged by floods. Furthermore, the survey established that 14% of households whose sanitary facilities were affected by the floods experienced coughing.

**Housing**

Among the one hundred and nine (109) sampled households, 36% indicated that their houses collapsed due to excessive impacts of floods while the rest had their houses intact. Furthermore, within the number of households who indicated having had their houses affected by floods, 75% were male headed households with the remainder being female headed households. Of the households whose houses collapsed due to floods, 66% were married and 16% widowed. The implication is that since the married and widowed heads of households are the majority and the family sizes are large, they may not be able to be integrated within unaffected households due to size of the houses.



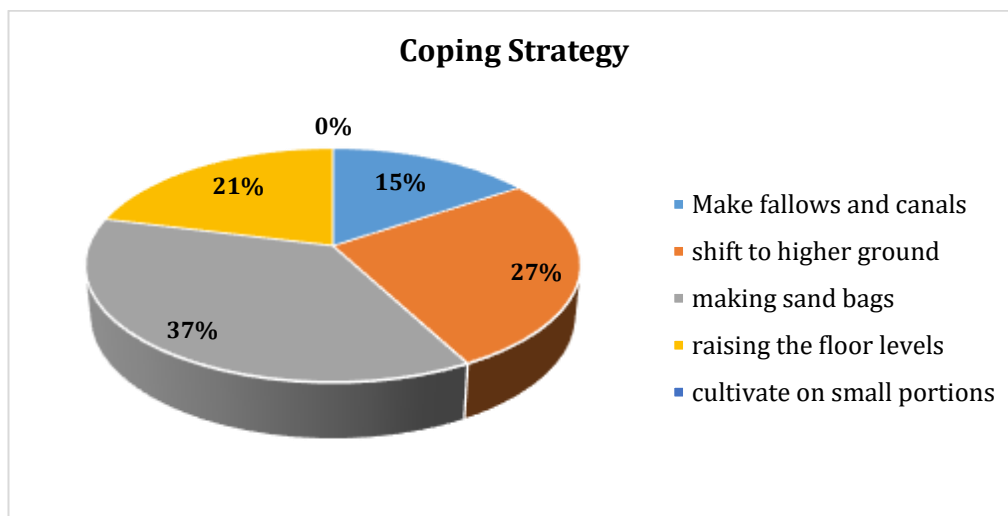
**FIGURE 10:** Comparative Analysis of households whose houses collapsed during floods

About 32% of the households whose houses were impacted by floods were forced to relocate to other alternative areas while the remainder continued to stay within their home states. The community discussions revealed that some displaced households sent their children to stay with other relatives. This in a way disrupted their pattern of life and social networks. For those who have moved temporary to higher grounds, they have returned to their usual residence. Discussion with these households indicated a positive will to move permanently to safer havens should alternative fertile land

be secured by relevant authorities. It is worth mentioning that some households have shifted to a new area altogether.

**Coping Strategies**

The survey established that sampled households employed a range of coping strategies due to the floods. The most important coping strategies were making sandbags (37%), shifting to higher grounds (27%) and raising the floor levels (21%).



**FIGURE 11:** the range of coping strategies

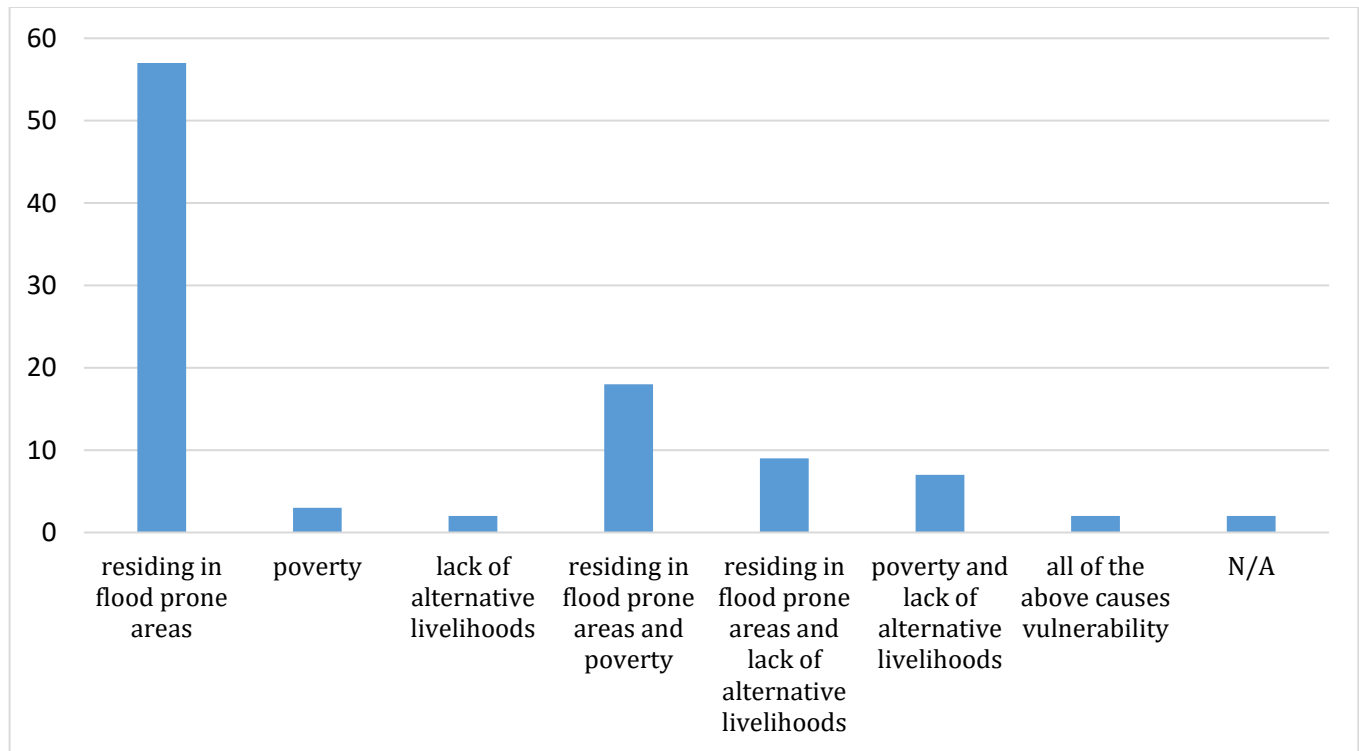


The research showed that households had diverse coping options with the exception of those households whose head were separated. Of the sampled households, 21% indicate that the coping strategies were not very effective.

**Underlying Causes of Vulnerability**

There were varying underlying causes of vulnerability to floods for most people in Jambutu ward.

Proximity to the flood prone area (57%), residing in flood prone area and poverty (18%) were identified as being the main underlying causes of vulnerability by the Jambutu community. The research revealed that the main underlying causes of vulnerability for the sampled households were residing in flood prone areas and poverty as can be seen in figure 12 below.



**FIGURE 12:** Underlying Causes of Vulnerability for the Sampled Households

It is very clear that most male headed households indicated proximity to flood prone areas (76%) and lack of alternative livelihood sources (83%) as the main underlying causes of vulnerability (see figure 13 below). Furthermore, the research revealed that most of the female headed households indicated poverty and

no alternative livelihood sources (41%) and the combination of all the three underlying causes (43%) as their main underlying causes of vulnerability (refer to figure 13 below which analyses the underlying causes of vulnerability in relation to the sex of the sampled household).

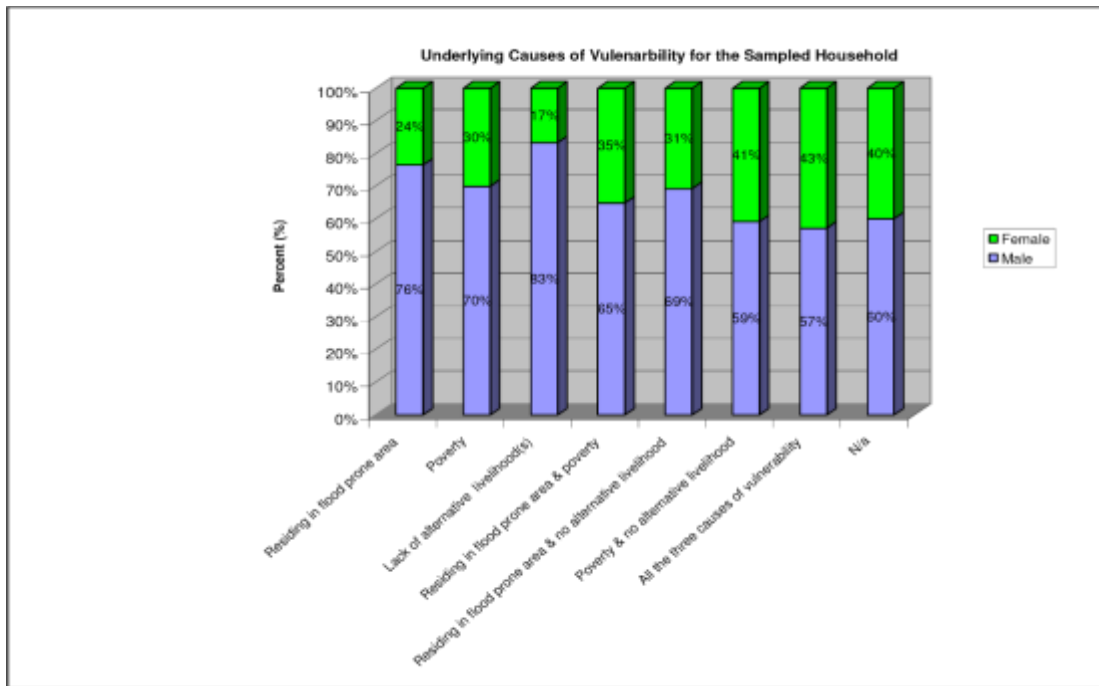


FIGURE 13: Underlying Causes of Vulnerability in relation to sex of the Sampled Household

Furthermore, it was also clear that all age groups for the head of households indicated proximity to flood prone areas as the main underlying cause of vulnerability. Furthermore, the research revealed that heads of households aged between 45-49 years (17%), 55-59 years (17%) and less than 25 years (18%) indicated poverty and no alternative livelihood as the underlying causes of the vulnerability.

The research further revealed that age groups less than 25 years (24%), 55 – 59 years (25%) and 60+ years (27%) indicated residing in flood prone area and poverty as the underlying causes of vulnerability (refer figure 14 below). There is need to enhance household’s resilience to flood impacts through poverty reduction strategies and promote diverse livelihood options which will ultimately reduce the levels of vulnerability.

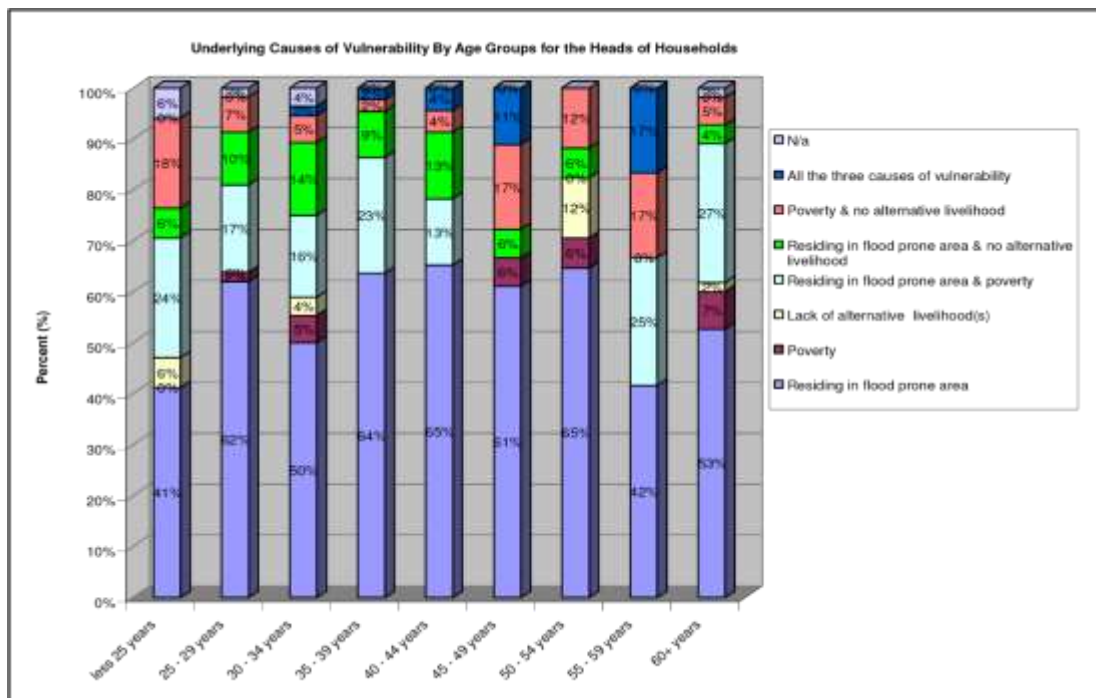


FIGURE 14: Underlying Causes of Vulnerability by Age Groups for the Household Heads

## INTERPRETATION OF THE RESULTS

From the results of the analysis it is clear that the floods, particularly from the 2018/2019 rainfall season impacted on the livelihoods and critical aspects namely Agriculture, Health, Education, Water and Sanitation, Housing and Property and Assets of people in Jambutu Community. The main livelihood of the sampled households was crop production followed by trading and fishing.

The survey established that over 90% of households had their crops damaged, mainly maize (92%) which is the staple crop and this ultimately resulted into food insecurity at household level. As discussed under the livelihood section, crop production was the main livelihood and income source. This in a way reduced people's income since income sources are embedded in livelihoods. Further, for those households who had some food stocks at the time of the floods, these were damaged and consequently compromised food security at household level.

Although health facilities were not affected by the floods, access to the health services was hampered due to damaged and/or washed away roads, bridges and culverts. This ultimately contributed to increased disease burden (mainly diarrhea, malaria and coughing) at household level. The disease incidences were also attributed to access to unsafe water sources and flooded sanitation facilities.

Regarding water and sanitation, the river was the main source of water followed by borehole for most of the sampled households. This means that households will continue to be vulnerable to increased disease outbreak as long as the river continues to be their main source of drinking water. This is as a result of increased contamination that occurs during flooding. Despite borehole being the safest water source for drinking, past vulnerability assessments undertaken within the district have shown that handling of the water by households due to distance to the source has led to increased disease burden such as diarrhea.

The education sector was equally not spared. Learning was disrupted due to submerged schools and damaged infrastructure.

Housing units, most of which were made of pole and mud were damaged in one way or the other forcing households to relocate to other alternative areas.

The results from the study established that households lost a number of both productive and nonproductive assets (both directly and indirectly) making them more vulnerable.

The results further show that the main coping strategies employed by households were shifting to higher grounds and making furrows and canals during floods. It is clear from the findings that these coping strategies are not very effective. The coping strategies employed by households depend on a number of factors, some of which include the type of livelihood strategy and marital status.

The results also show varying underlying causes of people's vulnerability which poses a challenge as far as reducing levels of vulnerability is concerned. These include poverty as the main one, residing in flood prone areas and lack of alternative livelihoods.

Overall the objective of the study as outlined have to a large extent been realized. Government and key co-parenting partners should implement the recommendations proposed in this study.

The findings from the study have implications for the development of the people in Jambutu Community and the nation as a whole. Hazards such as floods entail that efforts should be directed at formulating sustainable mitigation measures. Appropriate mitigation measures discussed under the recommendations section should be put in place in order to enhance community resilience in view of climate variability. Thus, the need to continuously assess the flood risk cannot be overemphasized.

The identification for mitigation measures should not only involve the vulnerable communities but all stakeholders including the Private Sector and Civil Society.

There should be adequate finding towards risk mapping, monitoring and implementation of preparedness and mitigation measures.

Investment in flood management, taking into account climate variability should be a priority. Further community awareness on the flood risk itself should be promoted.

## CONCLUSION

As discussed under various sectors and across sectors, it is clear from the study that floods had adverse impact on the socio-economic status of livelihoods for people in Jambutu Community. To a large extent, the study has established that livelihood patterns play an important role in settlement patterns. It is also evident that there are varying underlying causes of people's vulnerability and this poses a challenge for reducing or minimizing vulnerability. Proximity to the flood prone area, residing in flood prone area and poverty were identified as being the main underlying causes of vulnerability by the Jambutu community. The study has further demonstrated that effects of floods in one sector can affect other sectors of society. For instance, as discussed under the health section, the outbreak of disease incidences (malaria, diarrhea and coughing) was attributed to the impact of floods on water sources and sanitation facilities. The issue of water contamination of the river at the pick of floods and the handling of water from the borehole increases the health risk.

From the study, it was clear that households cope differently when affected by floods. The current coping strategies being employed by most households are not very effective. Discussions at community and district levels established that the coping strategies were not sustainable because they had been using them and yet the situation did not seem to improve. The local communities coping capacities should not be underestimated but rather built upon. The focus must be on improving livelihood conditions of the people.

The communities should be encouraged to build houses using durable materials and away from the flood prone area as a way of coping with the floods. Further the Ministry of Agriculture and Cooperatives should through the Extension Services encourage the communities to increase the area cultivated on the upland to enhance the food security at household level. Input support programme for the vulnerable but viable farmers should be considered.

Clearly, there is need to develop better and appropriate measures (as discussed under the implications and recommendations sections) to prepare and mitigate the effects of the floods there-of. Above all, the aim must be to involve all the players to enhance communities' resilience to floods.

## RECOMMENDATIONS

It is therefore appropriate in this chapter to highlight some policy consideration which, if implemented could play an important role in flood risk management.

Government and key stakeholders should engage communities in order for them to move permanently to higher grounds as they have expressed a willingness to relocate. The relocating should go with the provision of all the necessary socio amenities such as schools, hospitals, infrastructure, water and agriculture support for a period of three (3) years to enable the households to settle. Consideration should also be made to introduce alternative livelihood strategies in the new area of settlement.

There should be a deliberate policy to compel communities especially in rural areas to build house using durable materials and away from the flood prone areas. The Ministry of Agriculture and Cooperatives should through Extension Services encourage Communities to increase area cultivated on the upland in order to enhance food security and household level.

The relevant authorities should delineate both the non-flood areas and flood areas. The non-flood areas can serve as a temporary shelter for the settlements during floods. Construction of dams should be considered to trap the excess water. This could be used for irrigation. Government and key Stakeholders should engage the communities and local authorities in making them aware of the flood risk in view of the climate variability. Community initiated mitigation measures should be promoted so as to build community resilience. In the long term, community-based floods early warning system should be developed.

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