

# Disaster Profile and Response in Urban Informal Settlement of Mathare, Nairobi County, Kenya

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## ABSTRACT

**Background:** Disaster is an event that kills 10 or more people or leaves at least 100 people injured, homeless, displaced or evacuated. In extreme cases, these calamities usually impact negatively on the community and disrupt people's normal living. Kenya's informal areas are disaster prone due to households living under high voltage transmissions lines, railway line reserves, pipeline reserves, quarries and landfills, riparian reserves and others adjacent to heavy industrial activities. This dogma of urbanization calls for the need to address the planning needs of slums and informal settlements and making cities work for the urban poor entangled in these poverty and disaster traps. *Objective:* To evaluate disaster types, causes, response and mitigation strategies in Mathare slums, Nairobi county, Kenya.

**Methodology:** Retrospective study design was employed on six purposefully sampled key informants. Interviews and focused group discussion were used in data collection. The period of study was from January to December 2023. The study site was Mathare slum, Nairobi County, Kenya. Statistics of disaster victims and response were derived from local government administrator office records.

**Results:** There were four cases of fire that raged down households and businesses in Mathare affecting a total of 199 households. Illegal electricity, negligence and arson attacks were identified as causes of fire disaster. Two cases of landslides were recorded that affected six households, two victims injured but there was no mortality. Illegal structures build on and under the cliffs with no foundation and pillars have been identified as contributor of landslides in Mathare. There were two flood disasters that affected 1500 households with zero mortality. House structures built on riparian land, on drainage ducts and along riverbanks are the main reason of floods.

**Recommendations:** The government and partners should invest in educating residents on disaster prevention and education. Relevant government authorities should inspect and approve construction of buildings in Mathare. Arrest and prosecution of arsonists and educate against the vice. Government to construct and unclog drainage to manage rain water. Demolish illegal structures along the roads to create access in emergency response. Government and partners to set up disaster and relief coordination center in Mathare.

## INTRODUCTION

### Background

Disasters can be termed as events which affect the existence of the community, or affecting property and the environment exposing organizations which operate in this environment to losses (Mbugua, 2016). The Office of US Foreign Disaster Assistance (OFDA) defines a disaster as an event that kills 10 or more people or leaves at least 100 people injured, homeless, displaced or evacuated. Disasters are categorized based on their origin, they are either man-made (anthropogenic) or natural in nature. (Huho et al., 2016). In extreme cases, these calamities usually impact negatively on the community and disrupt people's normal living (Mbugua, 2016). Globally, an estimate of 186 million people was affected by disasters in the year 2022. There were 34.56 million affected people in Middle Africa, 32.26 million in West Africa, 30.55 million in East Africa, 13.20 million in North Africa, and 12.72 million in Southeast Asia. More than half of the affected people in 2022 (107.35 million) were affected by drought. Based on available data, 2022 disasters caused damage amounting to USD 223.84 billion. About 59% of the said amount (USD 130.98 billion) was damaged by storms and 20 percent (USD 44.93 billion) by floods (Asian Disaster Reduction Center, 2023). Human activities play a role in the frequency and severity of these disasters through global warming. Other natural disasters (geophysical in nature) that can be utterly devastating but occur less frequently are earthquakes, volcanic eruptions, tsunamis and avalanches (Huho et al., 2016).

Man-made disasters occur as a result of human activities thus also referred to as anthropogenic disasters. They can be divided into technological, sociological and transportation disasters. In most cases, man-made disasters are unintentional, but, can also be caused due to some intentional activities. There are a few which are intentional such as terrorism activities, but, most of them are as a result of accidents that could have been otherwise prevented if sufficient precautionary measures were put in place. Examples of man-made disasters include: structural collapse, chemical leaks, spillovers, nuclear leaks, man-made fires, terrorist activities, accidents and politically instigated violence (Huho et al., 2016). On record, 388 disasters occurred in 2022, more than thrice the average number of disaster events from 1990 to 2021 (119 disaster events). During the entire period of 1900-2022, flood (39%) and storm (31%) were the most frequent types of disaster. Globally, a total of 388 disasters occurred in 2022, they were distributed as follows; Flood (177 events, 46 percent), storm (105 events, 28 percent), and earthquake (31 events, 8 percent) were the three most frequent disasters. Several incidences of drought, landslide, wildfire, and extreme temperature and one volcanic activity were also recorded (Asian Disaster Reduction Center, 2023).

Despite the fact that disaster impacts vary from one community to the other or from one nation to the other depending on the level of preparedness, poor communities and developing countries are the most vulnerable. Asian and Africa are leading in the occurrence of disasters (Huho et al., 2016). Among the most devastating disasters in 2022 include the floods in Pakistan (June to September), Bangladesh (May to September), Guatemala (May), Nigeria (July), India (May), Chad (June), and South Sudan (August). There were droughts in Congo, Ethiopia, Nigeria, Sudan, China, Burkina Faso, Malawi, Cameroon, Central African Republic, Chad, Niger, and Mali. In the Philippines, typhoons Megi (local name: Agaton) in April and Nalgae (local name: Paeng) in October made tremendous impacts. In September, Cuba was impacted by hurricane Ian and the Dominican Republic was impacted by hurricane Fiona. Tropical Storm Sitrang impacted Bangladesh in October while Indonesia was impacted by 5.6-magnitude earthquake in November. Overall, Southeast Asia was struck with the most disasters in 2022 (flood, storm, earthquake, volcanic activity, and landslide) followed by South America (flood, landslide, earthquake, and wildfire), South Asia (flood, storm, earthquake), East Africa (flood, storm, and drought), and Northern America (storm, flood, and wildfire) (Asian Disaster Reduction Center, 2023).

Across the globe, the rate of urbanization has been on the rise, with 54% of the world population, which is close to 3.8 billion people residing in urban areas. Urban informal settlements have started to experience frequent flooding scenarios due to impacts of rapid urbanization and other human activities that have altered the environment and increased the volume of storm water that causes floods. Increased urbanization and

urban population have resulted in the emergence of several urban informal settlements that have been built in ecologically fragile areas prone to flooding. Studies that have been carried out worldwide on flood risk, vulnerability and resilience have revealed that flooding events in urban slums of most developing nations were as a result of paved urban surfaces, insufficient drainage systems and inadequate green spaces to allow infiltration of storm water. The occurrence of flooding events in urban slums of major cities is mainly attributed to unsustainable human practices that results to changes in the land use land cover (LULC) of the urban areas (Kaburu et al., 2019). The urbanization in Sub-Saharan Africa is rapidly increasing, with projections of doubling the urban population in the next 25 years. Poverty is a major determinant of health risks in urban areas, leading to a vicious cycle of poverty trap (Zerbo et al., 2020). It is estimated that by 2030, the number of urban dwellers that are prone to flooding will rise to 50%. The continued alteration of the urban environment either by clearing urban green open spaces, poor waste management, draining of urban wetlands and building in the urban riparian reserves will increase the vulnerability of the urban slum dwellers to floods risks (Kaburu et al., 2019).

Over the years and like any other parts of the world, Kenya has been exposed to a variety of both man-made and natural disasters such as fires, droughts, floods, landslides, HIV/AIDS, human conflicts, drug abuse, traffic accidents, oil spill, industrial accidents and terrorism. The diversity, frequency of occurrence and magnitude of the disasters has been on the rise in the last two decades resulting in increase in number of people affected. However, over 70% of the disasters are hydro- meteorological in nature. These comprise of droughts, floods and landslides (Huho et al., 2016). The Kenya Red Cross Nairobi branch reported more than 30 cases of fires have been reported in Nairobi's informal settlements in year 2023. It attributed most fire outbreaks in the slums to arson, bad electrical wiring, domestic violence and unsupervised stoves (Saya).

### **Problem of the study**

Kenya's informal areas have households living under high voltage transmissions lines, railway line reserves, pipeline reserves, quarries and landfills, riparian reserves and others adjacent to heavy industrial activities (Mwau, n.d.). Electricity distributions in slums are illegal, there are uses of non-standard electrical materials and these have been source of fire disasters in these settlements. To complicate the puzzle further, informal settlements are highly under-serviced with basic infrastructure networks and environmental pollution is taking its toll. Mathare slums is a catastrophe prone settlement; floods, house sinking and slope instability, landslides and other environmental hazards. Historically, a large section of Mathare Valley is an abandoned quarry site that had for long been mined for stone buildings and concrete. It is evident that shacks and buildings in this area sit on landfills and others at the bottom of quarry pits. Situated along the top of the rock cliff where the landslide usually occur. There are residential developments of high-rise buildings with some structures erected at the cliff edges. This definitely raises questions about the structural stability of those buildings. A quick topographical transect of Mathare reveals a sharp steep slope characterized by rugged terrains and two rivers that form part of the Nairobi river basin system flowing through the settlement. Apart from the residents in various villages of the valley living at the edge of unstable rock cliffs, there are thousands also living along the riparian reserve. These households occupying the riparian reserve are at risk of facing floods should the unexpected heavy rainfalls occur as it has recently been witnessed. With the weather patterns becoming more unpredictable, the urban poor in the city are at a higher risk of being victims of extreme weather patterns. The effects of climate change are evident and despite the urban poor in developing world contributing almost zero to global GHG emissions, the wrath of climate change has not spared them (Mwau, n.d.).

### **Study justification**

An analysis of the urbanization trends in Nairobi and other Sub Saharan cities symbolize slums as a definitive character of our cities. The school of thought that slums as temporal and they will be phased out as cities evolve through the linear trajectory development process is validness in the wake of everyday slum urbanism that has defined urbanization in the global south. This dogma of urbanization calls for the need to address the planning needs of slums and informal settlements and making cities work for the urban poor

entangled in these poverty traps (Mwau, n.d.). Comprehensive slum upgrading could take longer to realize; owing to its intrinsic complexities, resettling of households living in hazardous areas and reorganization of informal settlements to open up for roads and other basic network infrastructures is essential for disaster mitigation & management in the short- term (Mwau, n.d.). The role of communities in formulating solutions that work for them is essential and currently the potential of engaging communities in informal settlements is higher with the emergence of strong community based organizations in the slums. Turning a blind eye and assuming that the urban poor are ignorant, uninformed and not development conscious is the wrong assumption. What seems to be lacking is the right means towards achieving positive livelihoods transformations in the informal settlements (Mwau, n.d.). Data from this study can inform authorities and other stakeholders involved in mitigating slum disasters and also inform policy formulation. Results from this article have contributed to literature on disasters in Mathare slum and this has added onto scholarly facts.

### **Study objective**

To evaluate disaster types, causes, response and mitigation strategies in Mathare slums, Nairobi county, Kenya.

## **METHODOLOGY**

Retrospective study design was employed on six purposefully sampled key informants. The informants were the area local chief, two villages elder, and two community liaison officers at German doctors (Humanitarian office). Interviews and focused group discussion were conducted and additional data was derived from local administration officers' records and German Doctors relief aid records. Data was inform of pictures taken during the disasters and type of aid granted to the victims. The study area is Mathare Slum which is the second largest informal settlement in Kenya after Kibera. It has a long history of existence and is currently home to 206,564 people according to the National Housing and Population Census (2019). The settlement is characterized by hundreds of structures, densely packed and laid out without adhering to spatial layout guidelines. The settlement is largely classified into 13 villages, Kiamutisya, Village 1/Mlango Kubwa, Kosovo, Village 2, Mathare 3A, Mathare 3B, Mathare 3C, Mathare 4A, Mathare 4B, Mashimoni (including Mashimoni Village 10), Kwa Kariuki, Gitathuru and Mabatini (Habitat, 2020). The study period was from January to December 2023.

## **RESULTS**

According to data from the local administration office, the period of January to December 2023 recorded eight disasters. The disasters were human caused resulting to fire incidences. There were areas that experienced floods and landslides. Hunger was also a notable concern among Mathare residents.

### **1. Fire**

There were four cases of fire that raged down households and businesses in Mathare, valuation of properties destroyed remains unknown. Households affected were 199 in total and areas of fire disaster distribution was as follows; Baghdad area 174 households, Koria area 78 households, Area 4-cliff area 30 households and sea area had 17 households affected.

Table 1 showing four cases of fire that raged down households

<b>Month</b>	<b>Mathare area affected</b>	<b>Households affected</b>
July 2023	Koria	78
September 2023	Baghdad	174
October 2023	Cliff area 4	30
December 2023	Sea area	17



## Causes of fire disasters in Mathare

Illegal electricity connection within houses are a source of fire due to poor wiring and use of substandard electrical materials used in electricity distribution. Negligence of residents by leaving open fires from stoves, electric cooking coils and gas cookers is also another cause of fire incidences in Mathare slums. Arsonist attacks by gangs aiming to benefit from sell of iron sheets to scrap metal dealers have also been suspected to be a contributor of fire incidences in the area. Gender based violence, brawl among couples and revenge from separated couples have also been pinpointed as a contributor to fire incidences in Mathare slums.

## Discussion



Figure 1: Fire incidence in Mathare

Fire disasters are very common in both developed and developing countries. Files from achieves reveals Nairobi suffers frequent mysterious fires, especially in the slums and markets, which destroy property worth millions of shillings. It is known that at times the fires lead to injuries or even deaths. They have diverse causes which are either man-made or natural. Just like from our study, most of the fire disasters are man-made and include electrical faults (mostly due to overloading and short circuits), pantry area (cooking gas leaks, cooking oil, overheating of cooking medium), smoking (in/around combustible medium, falling hot ashes from the cigarette on a flammable material) and arsonist attacks. Overall, fire disasters are higher during dry period and some festive events when demand for electricity or use of fire is high. (Huho et al., 2016). In November and December of 2023, schools were on holiday, there is an increase in electric demand and that explains the successive fire incidence within those two months. Data released by Tushinde Children's Trust in May last year showed that 892 families had been victims of mysterious fires recorded from January 2021 to May 18, 2022, in Nairobi (Saya). In the year 2023, 199 households in Mathare slum were too affected by fire incidences.

## Fire prevention in Mathare slums

In the local administration meetings (Chief's barazas) locals are given skills on fire fighting. They are given talks on the essence of being careful and sober when using electrical appliances. Kenya power and lighting

company have stepped up fight against illegal electricity connection in the slums. House structures constructed along the access roads have been cleared to pave way to fire engines when responding to fire incidences.

## 2. Landslides

There were a total of 2 landslide disaster in Mathare slums and it affected 6 households. There were 2 casualties with minor injuries but no mortality. The two incidences occurred on 25<sup>th</sup> March 2023, affecting 5 households with zero casualties and the other incident occurred on 24<sup>th</sup> November 2023 affecting one household.



Figure 2: Land slide in Mathare slums

### Causes of landslides in Mathare

Money oriented individuals build and rent out structures constructed on and at the foot of cliffs with no foundation and pillars. During rainy seasons, the ground becomes soggy and sloughs off to cause a land slide. There are houses build at the foot of cliffs which are fallen on by avalanches from the cliffs



Figure 3: Illegal structure at the foot of a cliff fallen on by an avalanche during landslide



Figure 4: Illegally constructed house with poor foundation

### Discussion

Previously, On the dawn of Wednesday 4 April 2012, Mathare valley residents in Nairobi woke up to another disaster; a massive rock landslide had left 9 people dead (as of the morning of 5th April), several others hospitalized and another number was still unaccounted for (Mwau, n.d.). These past events explain the magnitude of landslide to Mathare residents and importance of embracing preventive strategies in place.

### Landslide prevention in Mathare

The local administration in conjunction with Nairobi County is marking unsafe structures located on and at the foot of cliffs. Occupants are advised to move to safer areas and education has been provided on the same.

### 3. Floods

There were two flood episodes in Mathare area that occurred in March and November 2023. The most affected people are those living in structures constructed along river banks and lands illegally reclaimed off rivers. An approximate number from the local administration office mentions a figure of 1500 households affected.



Figure 5: house built on reclaimed land off a river



## Causes of floods in Mathare

Structured build on riparian land and along riverbanks. Poorly constructed house structures. Reclaiming rivers for construction of houses

## Discussion



Figure 6: Houses constructed along river bank and on rain drainage area

Despite flood being natural disasters, in urban informal settings, these forms of disasters are caused due to human activities. In Mathare residents have constructed houses on riparian land, waste disposal in cause clogging of rivers. In Mukuru slums, poor solid waste disposal in the drainage systems was attributed at 32% as the main human activity that caused floods occurrence in the study area. In the study area, 28% of the respondents identified uncontrolled development as the other human activity that triggered the occurrence of floods. Further, 19% of the respondents stated that clearing vegetation along rivers and wetlands in the study area resulted in the occurrence of floods (Kaburu et al., 2019). The situation in Mathare is shared by residents of other informal settings. Lack of housing opportunities in urban areas has resulted in the emergence of urban slums as the costs of setting up houses and renting in these areas is low. The growth of slum population has forced a significant number of people to invade potential flood zones to set up more houses, thus making them more vulnerable to floods (Kaburu et al., 2019).

## Floods prevention

Public education on how to act whenever there are floods. Encourage the victims to move to higher grounds where there are schools and churches that have been marked to host displaced people. Discourage renting structures built along river banks and riparian land. Discourage constructing houses over drainage ducts. Discourage waste dumping in drainage ducts. Unclogging of drainage ducts

## Disaster response in Mathare

Effect of disasters in Mathare has led to loss of properties and resources. Children schooling has been affected in process when fires rage down schools and floods sweep away learning centers in slums. This kind



of disadvantage becomes a source of education inequity in slums. Strategies have been placed and more are in the process of being added in mitigating these effects of disasters in slums. The following actions are in place to combat and mitigate effects of disasters;

a) Nairobi county fire response team

The county government has a response team that has been prompt in addressing disasters in Mathare. There is a fire engine truck in case of fire, a response team comprising of paramedics and firefighters. Ambulance is usually in place to take care of the injured

b) Nairobi city county relief aid

From the office of the governor through the office of member of the county assembly, relief is sent to the victims inform of foodstuffs, beddings and clothings.

c) National government aid

Office of the local administrator, the chief, is involved in facts collection on disaster incidences. The office also coordinates relief aid from the national government and other philanthropists.

d) Humanitarian organizations

Non-governmental organizations in the area are also key in helping the victims recover from disasters. These organizations run hospitals that attend to victims. Others like German Doctors have community liaison office that coordinate distribution of relief inform of mattress and beddings

### **Mitigation strategies**

a) Disaster education and prevention

The government through the office of the local government administration has been involved in public education on strategies of disaster response and prevention. Through chief baraza, Mathare residents have been trained on firefighting skills. Whenever floods occur, schools and churches on higher grounds have been identified that can shelter the displaced flood victims.

b) National construction authority approvals

The county government building and construction section in collaboration with the national construction authority has been involved in inspection of buildings in Mathare. New construction of buildings must be approved by the relevant bodies before construction and only qualified personnel are permitted to head these construction sites.

c) Prosecution of arsonist

Investigation into arsonist attack has been initiated with concerted efforts of the local government administration office and the directorate of criminal investigations. Arrests and prosecution have been affected. The local scrap metal dealers who are suspected to be the beneficiaries of wreckage of the fire incidences have been subjected to inspection, approval and licensing from scrap metal council of Kenya.

d) Drainage

There has been construction of drainage system in Mathare slums with an aim of waste management and flood control.

#### e) Illegal structure

Along the road reserve, there have been demolitions of illegal structure build on road reserve and those encroaching access roads. This has paved way for ambulances and fire engines which can now respond to disasters promptly

### Gaps identified

#### a) Psychological intervention

In case of a disaster, families lose properties and in some incidences there is loss of lives. There is a gap in provision of psychotherapy first aid to disaster victims.

#### b) Corruption incidence in relief food

There are reports of corrupt activities when it comes to relief distribution. Disaster victims are left out and other benefit with the relief

#### c) Conflict of interest of politicians

Politicians are known to be using these disasters as a platform to elevate their political careers at the expense of victims. Relief food from the governor office and national government should have a single distribution point and the proposed disaster coordination office should be involved in relief food distribution,

## RECOMMENDATIONS

- Disaster response team to be formulated in Mathare slums. The selected locals should be offered advanced training in disaster management. These teams can be equipped with the necessary tools and equipment.
- Government and its partners to set up disaster management office to coordinate disaster response in the area and beyond.
- Fire hydrant points should be installed at specific points and they should be frequently inspected to ensure they function.
- The exercise to demolish illegal structures to open up access roads should be
- Non-governmental organizations working in Mathare should support the government and local communities in actualizing an efficient disaster response and relief management

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