
Vulnerability to displacement: the case of Kihoto, Kenya

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Summary

This working paper focuses on the informal settlement of Kihoto, located on shoreline between Lake Naivasha and the town of Naivasha. We provide an overview of the socio-economic impacts and displacement outcomes relating to the water level rise of Lake Naivasha, including reflections regarding the underpinning vulnerabilities that may increase the risk of people to disaster displacement. We also provide suggestions toward improving protection of communities vulnerable to disasters and climate change in general.

Our goal was to examine what factors make people vulnerable to disaster displacement in urban and informal settings, how disaster displacement exacerbates existing vulnerabilities and creates new ones, and how urban actors can better prepare for and respond to disaster displacement, given past experiences with flooding in the settlement. We conducted household and business surveys and participatory flood impact mapping in Kihoto, with a focus on the flood event of 2020, among people affected by displacement, three years later. Continuing problems include the pervasive loss of livelihoods, housing and access to essential sanitary facilities, such as water and medical care. The delayed economic recovery and the absence of official help compound underlying and pre-existing vulnerabilities.

From our surveys, we found the following: the combined effects of floods, displacement and the COVID-19 pandemic severely damaged many people's incomes and eroded their long-term resilience, including through loss of income and savings due to unemployment, increased costs, loss of business or housing, and loss of local savings schemes. In particular, the flooding had severe impacts to horticulture and agriculture (primary employers) and businesses that were already struggling due to the pandemic. Women between the ages of 18 and 35 reported the greatest loss of livelihoods and that they were unable to find work after the disaster. Further, social support networks were often eroded due to separation caused by displacement and due to instability caused by the events, although they were also found to provide support in the absence of formal support mechanisms for the community. Vulnerability to displacement is further increased by limited official capacity to handle disaster response and recovery in informal settlements and by limited access to basic services (such as sanitation, safe water and healthcare), which both contribute to worsened disaster risks and to slower recovery.

1. Introduction

Across the East African Rift Valley, pressures from disaster-related displacement are culminating in a slowly unfolding emergency. Following the increase in water levels in lakes in the region, lives, livelihoods and local economies have been severely impacted, as has biodiversity (Baraka, 2022; Herrnegger, 2023; Herrnegger et al., 2021). Flooding has led to widespread displacement, including around lakes Baringo, Turkana, Victoria and Naivasha (Government of Kenya & UNDP, 2021; Kiage & Douglas, 2020; Obando et al., 2016). Considering the rate of urbanization and higher population densities around many of the affected areas, an increasing number of people and assets are at risk (Herrnegger, 2023).

By 2021, the escalating situation and associated floods generated humanitarian crises that affected more than 75 000 households in 13 counties in Kenya alone, leaving nearly 400 000 people in need of humanitarian assistance (Government of Kenya & UNDP, 2021). The situation could worsen under future climate change projections (Wainwright et al., 2021).

Despite its scale and impact, the issue has escaped public attention until recently (Baraka, 2022; Herrnegger et al., 2021). The phenomenon was first described in research by Onywere et al. (2013), who noted that the geospatial extent of the flooding between 2011–13 around lakes Naivasha, Nakuru, Bogoria and Baringo corresponded with much wider historical trends, such as notable area and volume increases of the East African Rift Valley lakes in 1901 and 1963.

Since 2013, others have documented these changes in more detail. Focusing on Lake Nakuru, Gichuru & Waithaka (2015) assessed the increase of the water's surface area between 1984 and 2013 – noting an increase of 89% between 2009 and 2013. A similar trend is evident between 2010 and 2020 as well for other lakes: the area of Lake Solai increased by 123%, followed by lakes Nakuru (+70%), Baringo (+59%), Bogoria (+28%), Elementaita (+25%) and Naivasha (+21%) (Herrnegger et al., 2021).

The issue of lake expansion and subsequent displacement is not straightforward. The drivers of the phenomenon are understudied, and research is lacking regarding the socio-economic impacts and displacement outcomes of repeating and worsening flooding in the area (Herrnegger et al., 2021; Obando et al., 2016). With this paper, we seek to fill this gap by examining the informal settlement of Kihoto. We take a holistic perspective and make suggestions for managing risks (and displacement concerns) in a highly sensitive and increasingly exposed setting.

This case study also contributes to filling a wider gap in knowledge regarding risk management in informal settings, often neglected in policy and practice, and responds to research needs regarding long-term displacement outcomes. Although our data are primarily based on self-reporting and lived experience, they provide a useful starting point for policymakers and practitioners in the absence of data on these topics.

The following sections provide the theoretical grounding necessary to understand complexity of our case study and its context, with an introduction to the study site in Kihoto, where researchers from SEI Africa led household and business surveys, focus

group discussions and participatory flood impact mapping between 2022–23. We distil this qualitative information with the aim of improving the protection of people residing in informal settlements and to guide future planning for risk reduction in urban and informal contexts in relation to the ongoing lake level rise across the Rift Valley.

1.1 Rising waters and climate change: a complex relationship

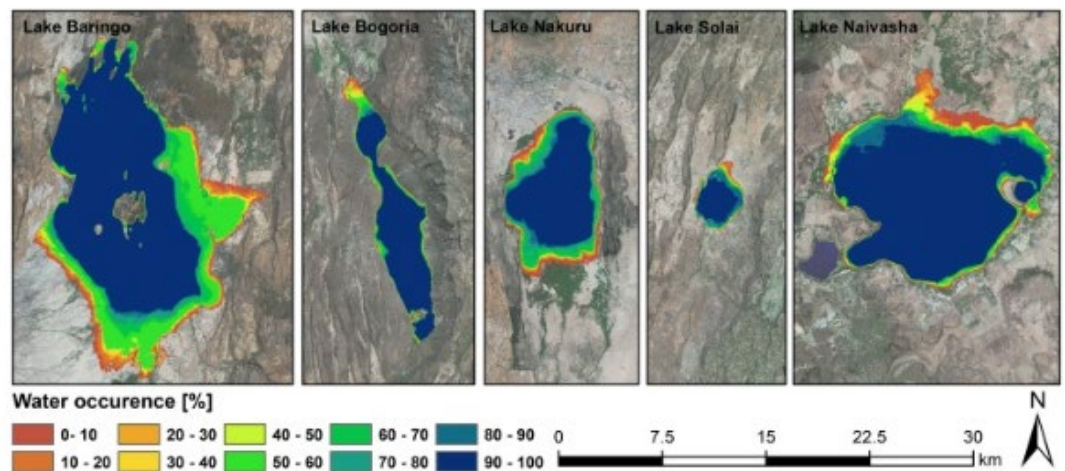
The phenomenon of rising lake levels in the East African Rift Valley is often attributed to anthropogenic climate change, disregarding potential geological causes and socio-economic factors such as land use. In Nakuru, an assessment led by the county government (Kiogora et al., 2021) suggested that the extraordinary water level rise could have resulted from a complex interplay of hydrometeorological factors, shifts in land use, and the geological composition and structure of the rift basin that, respectively, have increased rainfall, river inflows, and possible seismic erosion followed by siltation. Although the study examined potential complexity, its conclusion emphasized “anthropogenic climate change” and related increased rainfall as the primary driver of these developments. A multi-agency technical committee headed by the government of Kenya and UNDP (Government of Kenya & UNDP, 2021:xvii) also attributed rising water levels primarily to climate change, evidenced by “the level of rainfall in the catchment areas as documented in the various rainfall gauging stations”.

Since fluctuations of the lake levels correlate with changes in the East African monsoon, as well as tropical depressions from the southern Indian Ocean (Wright et al., 2015), climate change is most likely playing a part in lake level rise. However, it is worth noting that the Great Rift Valley lakes have changed over the past 12 000 years, before the Industrial Revolution and human-induced climate change. Alongside changes in the East African monsoon, many of the lakes have grown and shrunk due to closed basins that remain sensitive to heat and evaporation. For instance, Wright et al. (2015) demonstrated such changes in human mobility patterns followed water level changes in Lake Turkana based on archaeological evidence: when lake levels fell in the Late Holocene, humans specialized in animal pastoralism, no longer fishing or foraging as the lake dried out.

More recently, Lake Victoria rose by over 2 m between 1961 and 1964, leading to the doubling of the White Nile outflow during the same period (Sutcliffe & Parks, 1999). Similarly, Lake Naivasha merged with Lake Oloidien, due to a 15-m surface level increase in the mid-19th century (Van der Meeren et al., 2019).

Researchers have also hypothesized other geologic and human-driven reasons for changes to lake levels, beyond altered rainfall patterns and other related climate shifts. For example, some of the lakes could be affected by movements of tectonic plates, which can decrease subterranean outflows in lakes without surface outlets (Herrnegger et al., 2021). Land cover change and environmental degradation from human activities could also clog underwater outflow pathways, due to increased sedimentation and siltation within lakes (Kiage & Douglas, 2020). Each of these factors, or their combination, could contribute to the water level rises (Figure 1).

Figure 1. Water occurrence “masks” show the fluctuation of the lake surface area between 1984 and 2020 (100% representing permanent surface water) for the lakes Baringo, Bogoria, Nakuru, Solai and Naivasha.



Source: Herrnegger et al. (2021)

Therefore, a straightforward connection between climate change and lake level rise should not be drawn without comprehensive empirical evidence. Furthermore, attribution to climate change, for extreme events or more-slowly moving systemic transformations, can be used to shift attention from underlying socio-economic vulnerabilities and existing suffering, which then dilutes the centrality of vulnerability reduction or political accountability in mitigating risks arising primarily from socio-economic and political causes (Lahsen et al., 2020).

As we discuss below in the context of Kihoto, a changing environment or future climate concerns are not the reason to take immediate action. On the contrary, the past and current conditions that continue to adversely affect the settlement today – the local socio-economic situation, existing vulnerabilities, displacement from the flooding in 2020 and lingering impacts of the COVID-19 pandemic – are reason enough to act now.

1.2 Disasters, displacement and vulnerability

Displacement is defined as a situation in which people are forced to leave their homes or place of habitual residence, within or across national borders (Wilkinson et al., 2016). As such, it remains of significant concern, particularly in urban areas that tend to be poorly prepared in two dimensions: for in-migration that may follow displacement elsewhere and to displacement taking place within urban regions (Gemenne et al., 2021).

However, displacement should not be attributed to environmental triggers alone (Blaikie et al., 2004; Oliver-Smith, 2013). On the contrary, disasters and climate change may trigger displacement when interacting with underlying vulnerabilities that have increased individuals' sensitivity, exposure, impoverishment or marginalization or have reduced their adaptive capacity to cope with hazard impacts (Few et al., 2021;

Jayawardhan, 2017; Mavhura et al., 2017; Ober, 2019; Oliver-Smith, 2013). For example, people may become displaced due to socio-economic stressors that limit their ability to safely migrate (Mavhura et al., 2017; Oliver-Smith, 2013), or marginalized people may be excluded from disaster preparedness and mitigation efforts that may aid in preventing displacement (Few et al., 2021).

In relation to these concerns, complex social dynamics involving gendered roles may also affect individuals' ability to protect themselves from displacement. Caring roles, gender-based economic marginalization, discrimination and gender-based violence can all shape vulnerabilities in pre- and post-disaster phases (Anastario et al., 2009; Enarson et al., 2018).

Displacement also generates new vulnerabilities, constituting a twofold problem for policymakers and practitioners. Indeed, post-disaster displacement scenarios may generate instabilities such as conflict, communicable diseases, food insecurity, psychosocial suffering, worsened poverty or the loss of financial assets, all of which can have cumulative negative impacts on people's capacity to protect themselves from hazards (Blaikie et al., 2004; Loebach & Korinek, 2019; Pinto et al., 2014). Social networks and support structures may also be weakened by displacement, leading to the breakdown of ties that can support an individual's recovery (Pinto et al., 2014).

Matters are complicated by human agency, as all decisions involving mobility (and even displacement) are shaped by differing capacities and decisions to move when people assess and respond to options available to them (Marino & Lazrus, 2015; Ober, 2019; Wilkinson et al., 2016). In Kenya, research studying migration and displacement in relation to the droughts of 2011 suggested that lives and livelihoods had been transitory across many generations and that relocation always has taken place between rural villages and cities depending on drought conditions (Willett & Sears, 2020). Resettlement and internal displacement – although arduous and taxing to individuals experiencing severe poverty – were experienced as temporary, given that people's connections to their home communities remained strong. While some (usually younger men) moved to cities as a response to the push factor of droughts, others stayed despite severe conditions: often, women, children and elderly people remained in villages as men migrated in search of employment (Willett & Sears, 2020).

Consequently, legal-political efforts that consider people as simply "vulnerable" or "displaced" may fail to reflect the diversity of experiences, as well as sidestep efforts to incorporate ethical responses that go beyond labelling. To understand these issues, it is necessary to critically reflect on theory and previously held assumptions before imposing theory on practice, particularly if the intention is to build resilience of vulnerable populations to protect them from displacement risks (Pinto et al., 2014).

2. Methodology and local context

Based on the literature briefly discussed above, we developed key three questions that underpin our research approach for understanding vulnerability to displacement in Kihoto. Room for revisions was integrated into the research design, factoring in the complex relationship between development and displacement, as well as vulnerability and displacement outcomes. Three key research questions for this report are:

1. What factors make people vulnerable to disaster displacement?
2. How does disaster displacement exacerbate existing vulnerabilities or create new ones?
3. How can urban actors better prepare for and respond to disaster displacement, for instance through urban planning, land use planning or disaster risk reduction measures?

To understand the nexus of lake level rise, socio-economic context and relationship of vulnerability to disaster displacement, we elaborated these questions through household and business surveys, as well as focus group discussions in the informal settlement of Kihoto focusing on the flooding event of 2020. We engaged stakeholders in participatory mapping exercises, described below, and used the resulting responses to determine our findings (Section 3).

2.1 Kihoto and the 2020 floods

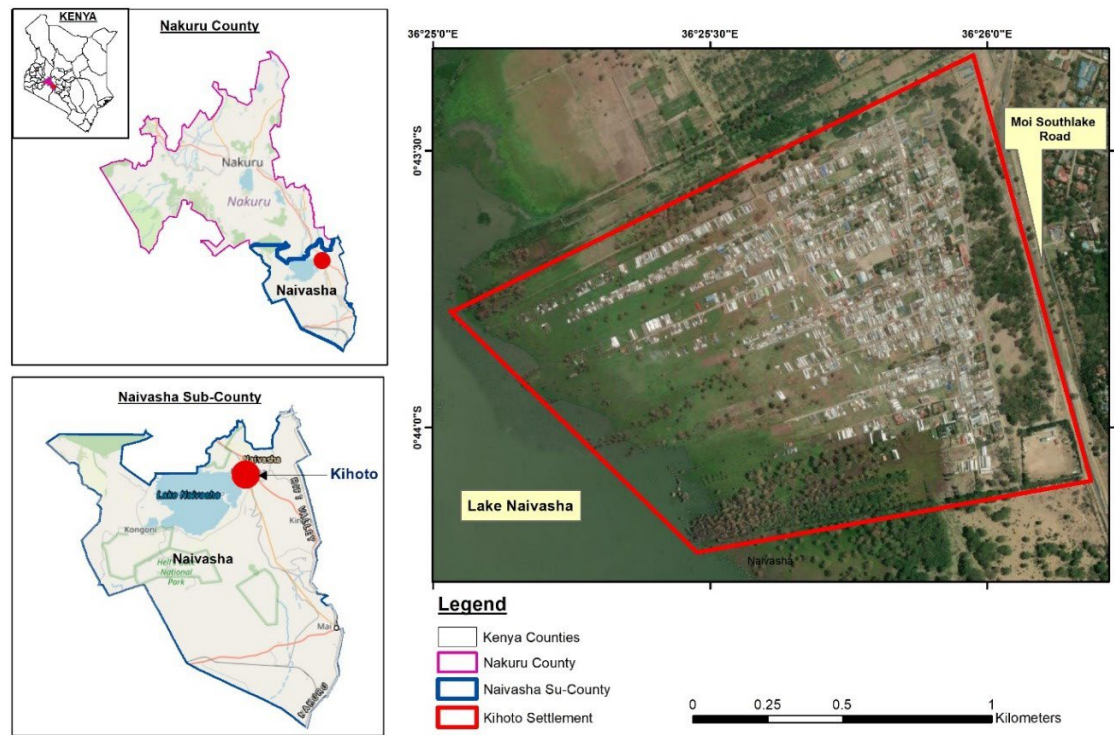
Kihoto is an informal settlement located at Lake Naivasha, Nakuru County, Kenya (Figure 2). At an elevation of 1884 m, the lake is the highest in the East African Rift Valley, with a surface area of 139 km².

The area supports notable concentrations of fauna and flora due to its fertile soil and varied ecosystems, particularly on the floodplains where the Malewa and Gilgil rivers enter the northern shores of the lake. The swamps, surrounding riparian grasslands and acacia forests are home to hundreds of bird species and grazing mammals (including a noteworthy population of hippopotamus), providing livelihoods for fishers and pastoralists.

The lake has high economic importance as a centre of Kenya's floricultural industry, and the pressures generated by cultivated lands and water drawn for irrigation strain the lake's ecosystems. Recently, following unsustainable economic development, cultivation and associated environmental degradation, the wetlands have degraded and woodlands and vegetation cover eroded (Onywere et al., 2013).

Tourism related to the lake and its ecosystem is a major economic activity. The area attracts significant in-migration due to livelihood opportunities in this industry. As noted by respondents taking part in the focus group discussions for this study, the area is also relatively affordable and provides adequate services such as hospitals and access to schooling.

Figure 2. Geographical location of Kihoto Settlement in Naivasha Subcounty within Nakuru County, Kenya, mapped in 2023.



Source: Authors' own

However, the socio-economic conditions are challenging. The seasonal nature of the flower industry and tourism translates into job insecurities, which, combined with poor pay and lack of other opportunities, leads to high poverty rates (Mutisya, 2012; Wairuri et al., 2018). Furthermore, the working conditions are often poor with little protection for workers' rights and rates of unemployment fluctuate depending on the season, contributing to the socio-economic marginalization of lower income populations (Mutisya, 2012). Lack of infrastructure, limited access to clean water and issues of health are also a concern, since the delivery of services has not managed to keep up with rapid population growth (Mutisya, 2012).

The socio-economic context thus underpins numerous vulnerabilities, many of which were revealed by the 2020 flooding. In association with the water level rise, the disaster forced over 1400 people out of their homes in the Kihoto and Kamere Beach settlements (Government of Kenya & UNDP, 2021). In Kihoto, some 500 people were displaced (Karanje, 2022). Numerous flower farms and crop fields were submerged, and livelihoods were destroyed, while the population was trying to simultaneously recover from the disruptions caused by the COVID-19 pandemic that had disrupted tourism and trade (Government of Kenya & UNDP, 2021).

Although local and national governments supported the affected residents via the provision of supplies and led the resettlement of some families to higher grounds, assistance remained limited and ad-hoc (as will be discussed in the findings, Section 3). Consequently, the event and, by extension, the continuing rise of water levels continue

to reshape displacement vulnerabilities and mobility patterns, and therefore create new risks, which is the focus of this paper.

2.2 Participatory spatial mapping

We used participatory spatial mapping and analysis to explore and collate the spatial aspects of the flooding affecting Kihoto in 2020 (Figure 3), following Participatory Geographical Information Systems (PGIS) (Cinderby et al., 2008). The mapping activity was executed to complement the community and policymakers' focus group discussions, key respondents' interviews, and household and business surveys. The purpose was to gather the spatial knowledge of the local community, focusing on the following:

- identification of the areas in Kihoto that are most vulnerable to and most impacted by flooding
- documentation of evacuation routes, relief centres and shelters used during the disaster
- post-disaster mapping solutions and improvements needed in specific locations within Kihoto
- spatial distribution of the existing households and businesses
- spatial distribution of the buildings' structural types and ownership in Kihoto.

Figure 3. Community participants in a PGIS mapping exercise at the first workshop organized in the town of Naivasha.



Photo: Lawrence Nzuve (SEI).

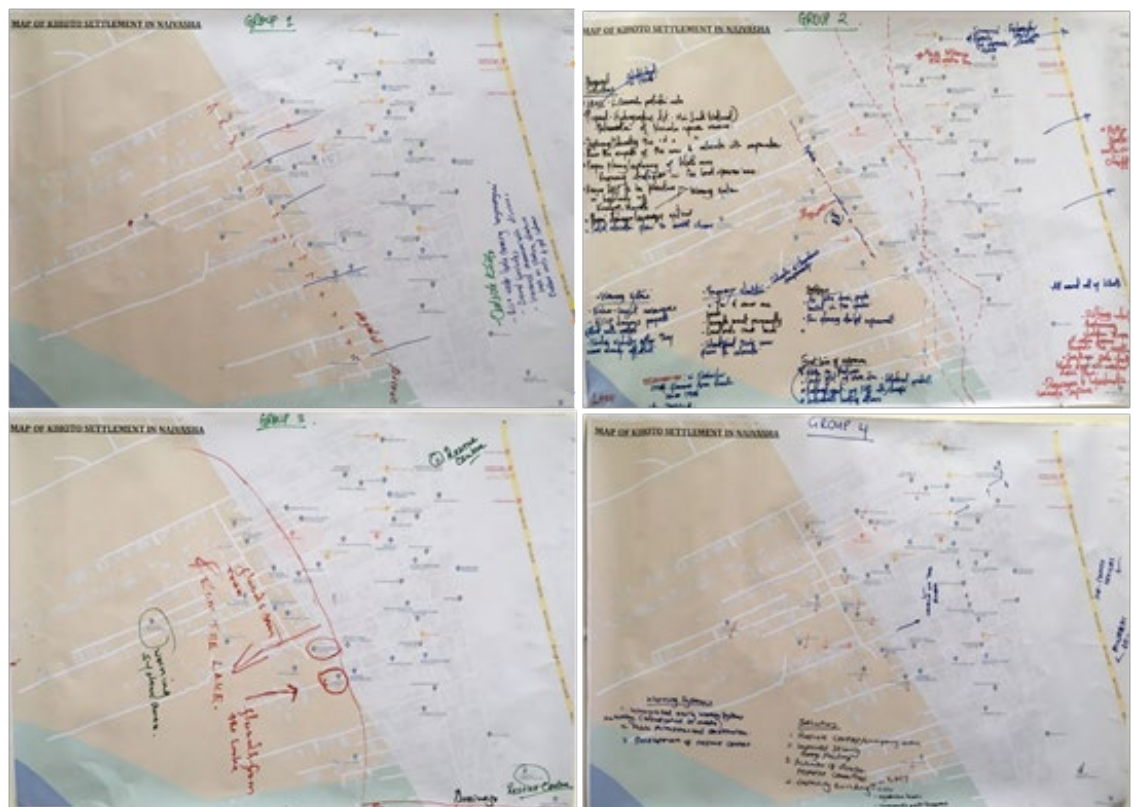
The PGIS activity was executed during the study's inception workshop with the community, local leaders and government officials, which was held in Naivasha town. An open street map of Kihoto was obtained using QGIS software and printed on four hard-copy A1-sized papers that were used in the exercise, engaging participants placed in four mixed groups.

Participants used different coloured marker pens and sticky notes to locate the study's highlighted displacement parameters on the provided hard-copy maps (Figure 4), with guidance from SEI researchers working with each of the four groups.

In the second phase, during the field surveys in Kihoto, the GPS coordinates of each household and business were recorded, including their structural types and ownership status.

The information mapped through participants' responses from the PGIS exercise (Figure 4) was collated, digitized and presented for analysis and interpretation using the ArcGIS 10.8.2 platform. The physical maps were digitized by scanning, then imported to ArcGIS as image overlays and georeferenced to align with Kenya's Universal Transverse Mercator (UTM – Zone 37 N) projections. Attributes and labels were assigned to the digitized areas to indicate the flood hotspot intensity; the images were used to discern and visualize the evacuation routes, as well as the distribution both households and businesses within the study site (figures 5 and 6).

Figure 4. Physical PGIS Activity maps with input from participants, describing the different spatial attributes and impacts of the 2020 floods to the settlement.



Source: Authors' own

Figure 5. Map overview based on participatory reports in 2023, including most affected areas, temporary relief centres and evacuation routes with the flood intensity map in the middle.

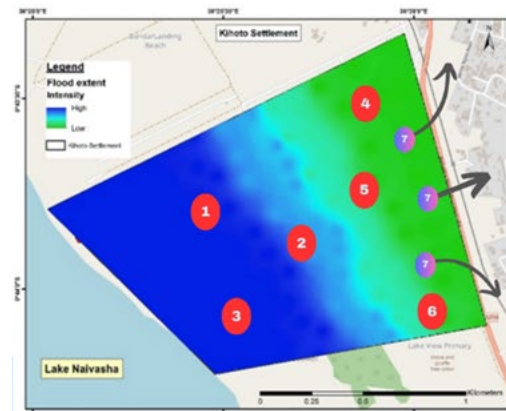
Some of the most affected areas:

1. Full Gospel Church
2. Street near Kihoto Church of Christ
3. Farming activities near the lake

Health and relief centres:

4. Kenya Assemblies of God Church
5. Kihoto Medical Centre
6. Lakeview Primary School

Evacuation routes (7, purple with arrows)



Source: Authors' own

2.3 Household and business surveys

Fieldwork took place in February 2023. The case study team and five research assistants from Kihoto interviewed 201 individuals of the nearly 500 displaced via a household survey. Another survey focused on business owners affected by the 2020 flooding (111 individuals).

We used a stratified sampling method to determine whom to interview when conducting the household and business surveys. Stratified sampling involves dividing the target area population into non-overlapping subgroups, based on auxiliary information such as place of residence, socio-economic background, age, gender and other characteristics.

We trained the research assistants to ensure the clarity of the survey tool. We also adhered to SEI's [guidelines](#) on ethical research practice, accompanied by ethical review of the project plan. Questions asked in the household survey included basic information covering demographic factors that may relate to vulnerability (such as age, disability and level of income), as well as questions targeting the socio-economic impacts and displacement outcomes of the 2020 floods. The third section of the questionnaire sought to elaborate longer-term impacts of the flooding, for example, whether people could return to their previous employment, and matters affecting their quality of life in terms of services, housing and education. The fourth section examined the effectiveness of disaster response, including questions regarding access to emergency shelters and early warning systems; recovery, such as whether relocation plans were in place or if institutions are in place with the mandate to work on these; and perceived priorities for future vulnerability and risk reduction in Kihoto. The business survey entailed similar questions, focusing more on the broader effect of hazards to businesses and economic recovery.

Informed by our literature review, the household survey included a section dedicated to understanding how the lives of those affected changed in the aftermath of the event in the dimensions of employment, housing conditions, livelihoods, security, healthcare, education and access to services. To further assess gaps in response, relief and long-term needs, we also surveyed how people received financial or social assistance, and psychological support were also surveyed.

2.4 Focus group discussions

To complement spatial mapping and surveys with qualitative data, the research team also organized focus group discussions to enable the collection of perspectives and opinions in a non-structured and less hierarchical manner with vulnerable groups separately (women, elderly, persons with disabilities and youth). They were also organized with plot and business owners to further support the survey targeting business owners.

On average, 15 respondents participated in each focus group discussion, and the sessions lasted between 45 minutes to 1 hour at a centrally located place (church) with mobilization support from the local town chief and community health volunteers. Despite not being a statistically representative sample of the population, focus group discussions can obtain qualitative data to generate an in-depth understanding of contextual social issues and empower participants to participate in research (Nyumba et al., 2018).

The meetings were not recorded (audio or video), and responses were collected as hand-written notes. Rapporteurs for this process were Carol Mungo, Cynthia Sitati, Sharon Anyango Onyango and Lawrence Malindi Nzuve.

2.5 Validation workshop

After data collection from the surveys and focus group discussions, the study team finalized the analysis and compiled the findings to share with a selection of participants to validate the results. The validation workshop included members of the community involved in the survey as well as local government officials, on 26 July 2023.

The workshop brought together 40 participants involved at different stages of the study, either in the first workshop, the household and business surveys or focus group discussions. Participants noted that SEI was the first institution to come back after collecting data and providing this feedback to them. Furthermore, by engaging government officials, including ward officers, as well as authorities at county and subcounty levels, the workshop enabled direct dialogue between the community and government, which had not happened previously.

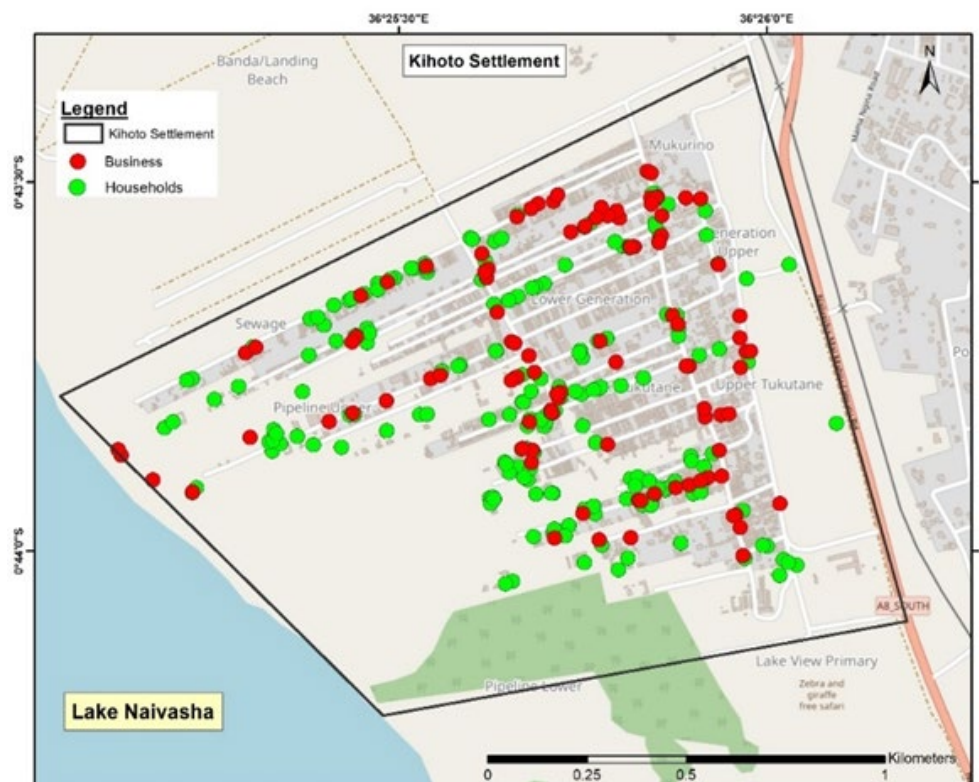
3. Findings

3.1 Overview and the spatial extent of the 2020 flooding

Based on the participatory mapping exercise, we generated a flood intensity map. The areas severely affected by the flood were highlighted, mostly in alignment with the low-lying shoreline (dark blue, Figure 5). Areas slightly upslope, nearly midway between the shoreline and town boundary, were reported as moderately affected (light blue), while the upper parts of Kihoto experienced low levels of negative effects of the floods in 2020–21 (green). Situated in this upslope area are public facilities, such as the Kihoto Medical Centre and Lakeview Primary School, the latter of which was used as a relief centre during the disaster.

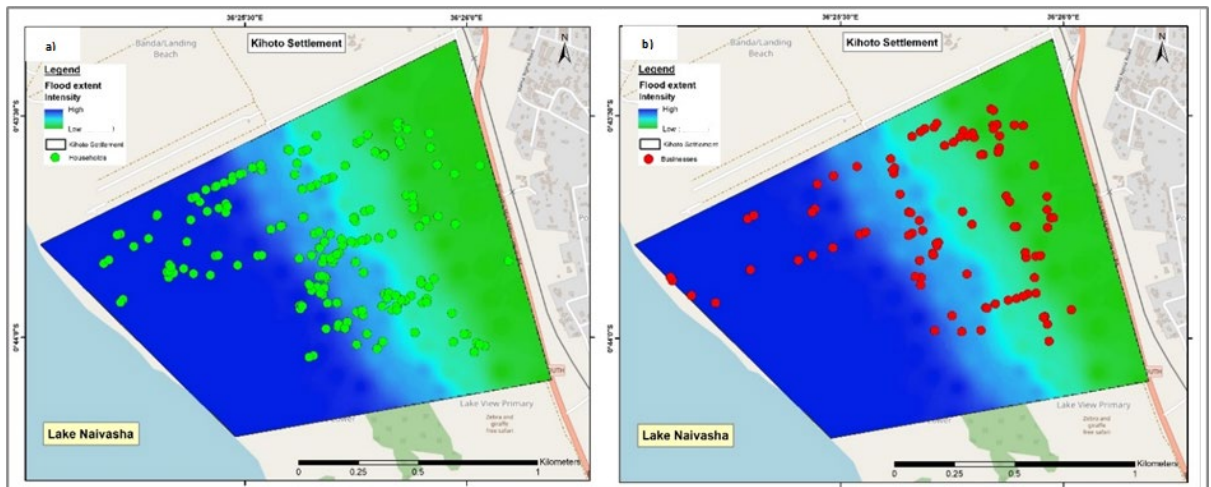
The distribution of houses and businesses in relation to the flood effects was estimated as a part of the PGIS mapping (Figure 6). The overlay maps in Figure 7, combined with the flood intensity map, illustrate that within the settlement, more households were located in flood hotspot areas compared to businesses, which were predominantly situated in the upper zones.

Figure 6. Distribution of households and businesses in Kihoto in 2023



Source: Authors' own

Figure 7. Distribution of households (left) and businesses surveyed as a part of the participatory mapping exercise, in relation to the 2020 flood impacts.



Source: Authors' own

3.2 Changing environment

The focus group discussions considered how vulnerabilities are being reshaped due to environmental changes and pollution from the flooding. Many of the participants reported that the soil has been affected by increased salinity that has decimated crops, even though Naivasha is considered a freshwater lake. Discussions also highlighted that agricultural yields since the flooding have been poor, and that the lake's water cannot be used for irrigation, which itself is an emerging need due to erratic rainy seasons reshaped by climate change (Palmer et al., 2023) – irrigation has not been previously necessary based on the experiences of respondents in focus group discussions.

Lack of safe water also contributed to pollution and the spread of communicable diseases after the 2020 floods. Indeed, both were reported as a concern, since water for drinking became expensive, and floodwaters contaminated the settlement by washing up human and animal waste in the absence of adequate drainage for sewage. These issues continue to magnify vulnerabilities to natural hazards and climate change, as Kihoto continues to lack adequate infrastructure and access to many basic services.

3.3 Socio-economic impacts of the 2020 floods

Household level

As per the surveys, the most commonly reported outcomes of the disaster were damaged housing in residential areas (highlighted by 189 of the 201 total respondents, or 94%). This was followed by the destruction of businesses and agricultural land, reported by 148 (73%) and 104 (52%) people, respectively. Considering that a quarter (51, or 26%) of the respondents relied on businesses as their primary income, and that the area is a hotspot for agriculture and flower farms, these findings indicate that

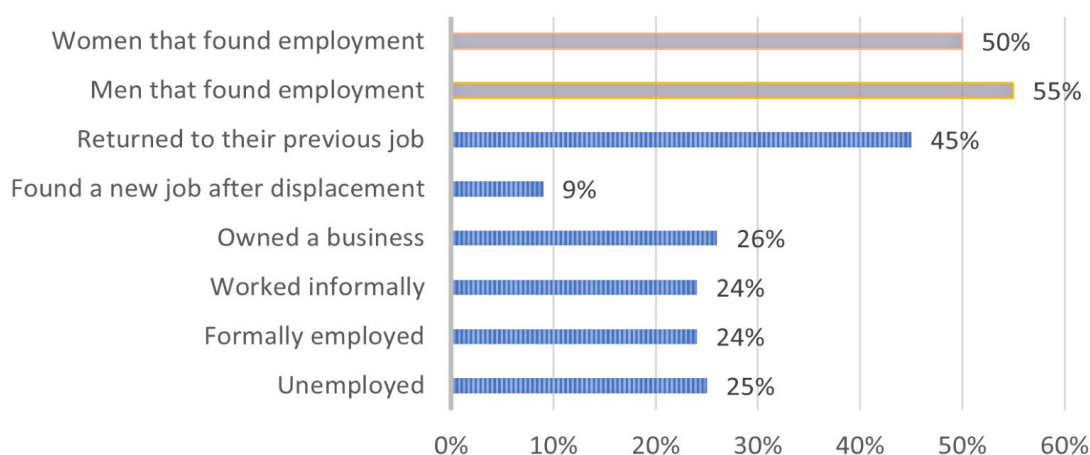
significant socio-economic disruption follows every time Lake Naivasha overflows its boundaries, flooding the neighbourhood, which is already struggling due to the economic impacts of the COVID-19 pandemic.

We had a double tragedy when the flooding disaster, the president had just declared Corona Virus a pandemic in March and most jobs/firms were closed. Just a month later, the flooding disaster hit us. People got more vulnerable to both disasters, and there were theft cases, as most plot owners got their assets vandalized and people forcefully took over the plots.

–Community member from the focus group discussion with persons with disabilities.

Of the total 201 respondents to household surveys (see Figure 8), 18 (9%) said they found a new job after displacement and 91 (45%) indicated that they returned to their previous job. Overall, 51 (55%) of the men and 54 (50%) of the women could find employment. However, almost half of those interviewed (92, 46%) could not find employment following their displacement, despite having jobs before the floods. Of the 49 women aged 18 to 35, 36 (73%) could not find a job or return to their old one.

Figure 8. Employment and occupation status after the floods, as of 2023, at the time of the survey (201 respondents)



Source: Authors' own

The majority (65%) of those who were unable to find employment (92 individuals) stated that no jobs were available (for example, due to the flower farms not hiring employees, as most of the farms have yet to fully recover from flooding). Furthermore, 5% of the 92 indicated that they do not have available financial resources or the ability to venture into business.

An overwhelming majority of all respondents (93%) considered income to be the main determinant of vulnerability to hazards in Kihoto (primarily flooding) – a finding supported by the area’s reliance on highly sensitive and exposed industries, such as horticulture, fishing, tourism and agriculture. In terms of perceptions regarding vulnerability to displacement, most respondents considered women and children to be among those most affected by the 2020 flooding and ensuing displacement (56% and 46% respectively), followed by men (36% and 34%). These perceptions are backed up by the fact that 64% of those unemployed at the time of the survey were women; unemployment tends to exacerbate risks they may face in post-disaster situations. These numbers are, however, not statistically significant and therefore difficult to verify.

As mentioned earlier, younger women reported that they also struggled to find employment following the flooding in Kihoto, suggesting that gender could potentially influence vulnerabilities and displacement outcomes. While we cannot confirm the specific social dynamics contributing to this problem, it may relate to Kenyan horticulture’s tendency to employ large numbers of female workers (Barrientos et al., 2005; Dolan & Sutherland, 2002), and the loss of jobs in the sector following impacts of flooding.

Issues of land tenure

Focus group discussions revealed an interesting dynamic relating to land tenure, which is a highly sensitive topic in Kenya. Kihoto settlement is comprised of three distinct categories of occupants:

- original landowners (first generation) who own large pieces from the initial subdivision of Kihoto, further subdivided into several plots
- plot owners who own single or multiple plots after the initial subdivision of Kihoto to second and third generation owners
- plot renters who rent single or multiple physical, temporary housing structures on a monthly basis.

During a focus group discussion with the Kihoto plot owners’ self-help group, the recorders noted that the group petitioned to have the government relocate the landowners to another area where land is of the same value. The main challenge discussed was the lack of a single channel or specific office in the government that handles these issues, as officials who handle landownership issues are currently dispersed between the departments of water, disaster response and lands, without any clear direction given from one authority, thus complicating the process.

Furthermore, when the floods hit in 2020, most of the homeowners had to temporarily rent houses, as they had to relocate from their original permanent homes. When the floodwaters started receding, the homeowners were the first ones to return to Kihoto – most of the respondents in this group expressed that they experienced in that period the psychological effects of moving away from their homes under duress, as well as

stress from incurred additional expenses due to paying rent, after owning their own homes. These unexpected costs may worsen poverty, constitute poverty traps, and contribute to exacerbated vulnerabilities in the future.

Impacts to business owners

We also conducted a survey focusing on small businesses, which are central to many people's livelihoods in Kihoto. The most common type of businesses operated in the informal settlement are *kibanda* (outdoor hotels), daycare, fishing, and kiosks selling clean water, eggs or milk. All the surveyed residents running businesses in the age group 18–35 operate aforementioned commodity-based or commodity- and service-based businesses. A few residents aged 60 years and older operate commodity-based and manufacturing types of businesses.

Based on the business survey responses, service-based businesses are highly vulnerable to flooding, due to their sensitivity to disturbances that may impact tourism and trade. Such work may contribute to displacement risk of individuals that own or work for these businesses. The greatest perceived risk in Kihoto was flooding, as reported by 64% of the respondents of the business survey when asked to specify a hazard that most affects their business in a multiple-choice questionnaire. When such events occur, most business owners reported that their businesses are heavily impacted due to the loss of customers and reduced sales.

Some have sought to adapt to these changes. For example, they changed their primary income from fishing to construction, or from running a kiosk to selling chicken feed and vegetables, after losing customers either due to the flooding or ongoing economic impacts of the coronavirus pandemic. Others, when facing the loss of livestock, turned to other options:

Initially, I had about 150 chickens for business and consumption, which were all lost during the floods. I completely lost hope, and now after the floods, I decided to open a mini shop as a source of livelihood.

– Community member from the focus group discussion with local women

Others abandoned businesses completely and sought to work for flower farms, as these enterprises eventually began hiring, though they paid lower salaries than before the flooding in 2020. Reopening a business was reported to be a challenge as well: nearly half (52, 47%) of the business owners who responded to the survey were not sure they would be able to ever reopen their businesses, due to destroyed equipment and changing market demands.

During the business focus group discussion, the group expressed their fears regarding insecurity following the loss of livelihoods and a challenging economic landscape.

Concerns over future disasters underpinned the discussions, as people remained unsure what to do and where they would receive support.

3.4 Disaster response to the 2020 flooding

When asked if they were aware of any public institutions or organizations that would address and oversee displacement-related issues in Kihoto, only 12% of the 201 respondents of the household survey answered yes. The Kenya Red Cross Society was mentioned by over half of those respondents answering yes. Furthermore, only 3% of all respondents had awareness or were a part of local programs that address displacement issues, and only 3% had heard of plans to make land and housing available for the evacuation or relocation of vulnerable communities. Overall, just 6% of those interviewed considered the current efforts to manage displacement as adequate.

Furthermore, the capacities to respond to disasters in Kihoto also appear to be limited. Only 8% of respondents knew about disaster response systems that have the capacity to support communities, referencing mainly the fire brigade, and only 9% knew about emergency shelters, including schools or churches used for such purposes. All but one of those responding “yes” to the latter also considered existing facilities to be poorly equipped.

Adding to these issues, only 23 people received early warning prior to the 2020 flooding, of which only 13 cited official sources, such as local media or outdoor public early warning systems such as sirens. From the perspective of risk management, these findings also indicate the limited official capacity to deal with disaster events in Kihoto, which is likely exacerbating vulnerabilities as well. Survey findings also align with our focus group discussions; as pointed out by participants, people of Kihoto tend to receive information from their neighbours and the community, including early warnings, but also knowledge about adaptation decisions such as what plant species to farm.

When mapping community opinions about what should be done to reduce disaster risks and the vulnerabilities to displacement, our survey revealed interesting and somewhat unexpected dimensions of the ways in which risks are perceived locally. We collated and categorized responses according to their themes, which revealed that about a quarter of participants considered infrastructural solutions, such as flood walls, levees or improved drainage, to be the most efficient methods to manage displacement risk and endangerment. However, just over a fifth of the respondents discussed the centrality of sustainable development and ecosystem-based solutions, including sustainable land use with regards to horticulture or planting of trees as flood protection.

About a fifth of the participants also suggested that the capacities to respond to disasters must be significantly improved, and the same proportion highlighted community involvement, education and awareness raising to manage risks. Only 8 people among 201 mentioned relocation as a possible solution. This suggests that the community generally shares a strong place-based sense of belonging.

3.5 Reshaped vulnerabilities and displacement outcomes

Quality of life

Of the total 201 household survey respondents, the majority indicated that quality of life had degraded in all studied aspects since the 2020 floods and associated displacement. The majority of respondents thought that the conditions had worsened for housing, livelihoods and security (65%, 78% and 62%, respectively). More than half of the respondents reported that they experienced loss of services such as water supply, sanitation and electricity, as well as loss of access to healthcare. Only a fifth of the respondents considered that their living conditions had improved, and around the same number thought their lives had remained the same or unchanged since their displacement due to flooding.

The role of social support

In terms of financial assistance and disaster relief support, 55% of the women and 45% of the men who were surveyed reported that they did not receive any at all. Those who reported receiving financial assistance for recovery were most often helped by family (71% of the respondents), while 10% received help from local or national government agencies, 9% from humanitarian organizations, and 6% from political institutions.

Similarly, 96% of those interviewed said they did not receive any psychological support from official sources. Notably, those over 60 and above reported they received the least financial aid, relief assistance or psychological support, suggesting that they are among the most marginalized and vulnerable to disaster impacts due to lack of targeted aid. However, 41% of the respondents reported support from family members. The importance of social connections is well encapsulated by the following recollections of community members of the 2020 floods, discussed during our focus group discussions:

There was an old woman who had to be evacuated forcefully by Red Cross, as she had already given up and was ready to die in the flood. She had no family and a possible place to move to, hence felt like she had reached a dead end.

– Community member from focus group discussion with elderly

I remember going out to the toilet and coming back and my house was flooded. I panicked, as I did not know exactly what to do, whether to take my children and leave everything to drown. So, I had to call my relative who was living around Kayole area a few kilometres, he rented a pickup [truck] immediately and came to evacuate us. He let us stay in one of his guest houses, which we felt was an inconvenience, but he was okay since no one was prepared for the disaster.

– Community member from focus group discussion with elderly

Family played a very big role during the time. The first people who got hit by the rising waters waited to alert the rest of us. Most government officials came and started blaming them, asking why they lived in the area and discouraged them, which made most people stressed, especially women and children. All we needed was simple words of encouragements to go through the experience.

– Community member from focus group discussions with women

The statements also describe experiences shared by many others. When asked about the most important factors that have helped the respondents to cope with displacement, more than half highlighted the importance of supportive family (66%). Similarly, in the focus group discussions with the youth groups, they discussed how they self-organized a disaster response “flood security group”, which prioritized and helped with the evacuation of women, children, and elderly and disabled people.

Changing social landscape

In Kihoto, disruptions to the social fabric also affected the operation of *chamas* – a Swahili term that loosely translates to “all pulling together” – referring to informal savings groups found in almost every African country, further described by Redford & Verhoef (2022). *Chamas* operate either as formal saving schemes, supported by microfinance institutions and banks, or more often informally via collective action. While voluntary, they are often an integral part of societies, serving as a tool of empowerment for the poor and popular among middle classes as well (Redford & Verhoef, 2022).

Focus group discussions revealed that *chamas* were crippled in the aftermath of the 2020 floods and displacement, since many people lost contact with members of their *chama*. Arranging money collection was hindered, and regular disbursements could not continue, leading to a loss of money for many who had either contributed to the group or were intending to withdraw funds.

Even as individuals moved back to Kihoto, *chamas* have not fully resumed; the few that have are saving and sharing money weekly instead of monthly. Insecurity likely limits people’s willingness to save or invest any of the little money they have made through business or formal employment. In turn, these conditions also contribute to the socio-economic challenges discussed in section 3.3.

4. Discussion

In the context of the ongoing water level rise affecting the East African Rift Valley lakes, we attempted to explore the complex and contextual socio-economic dimensions and drivers of vulnerability to displacement to better understand the current challenges and implications to policymaking. While intended to be an overview study to provide an outline of vulnerability concerns to support further enquiry, our findings have revealed major concerns that we think need to be addressed immediately, through targeted interventions that support vulnerability reduction and enable the protection of those affected by displacement risks. We found that most of these risks have very little to do with the lakes themselves, and more to do with the challenging socio-economic conditions and associated vulnerabilities that require urgent action now.

4.1 Current vulnerability and drivers of displacement risk

Socio-economic drivers

Spatial extent of the flooding had severe and direct impacts on households, farms and businesses located near the shoreline. Other research (Karanje, 2022) and our respondents also confirmed this finding, as the most reported outcome of the 2020 floods were the losses of and damage to houses and businesses. As a result, nearly 500 people were displaced, and almost half (46%) of the 201 people that we interviewed from that group could not find employment following the disaster, mostly due to the lack of available jobs.

In a context that is highly dependent on tourism and horticulture, the effects of flooding to these industries translated to severe economic instabilities in Kihoto and surrounding Lake Naivasha (Karanje, 2022; Obando et al., 2016). In the case of Kihoto, the COVID-19 pandemic had already affected employment in key sectors such as tourism, impacts that were worsened by the floods and displacement. Also noteworthy is that the highest rates of unemployment were found among young women (18 to 35), reaching nearly three-quarters of the 49 female respondents in this age bracket.

Loss of livelihoods is also a concern for business owners, due to loss of sales and sale of assets such as land and housing as a coping mechanism, which undermines the livelihood of many plot owners and landowners. This constitutes a problem for commodity-based trade in the absence of customers, as the ripple effects of disasters translate into lack of purchasing power of local businesses. If continued, all these issues – ranging from the loss of businesses to unemployment, maladaptation and high levels of debt at the community level due to borrowing – may constitute cycles of poverty that are reinforced by recurring disasters (Carter et al., 2007). Furthermore, given the breakdown of local *chamas*, communities are also struggling to access and accrue savings through communal groups – thus adding pressure to an already unstable situation.

Other research in the African context suggests that the loss of livelihoods, income and savings is a major contributor to displacement vulnerability, as well as a driver of

migration; economic pressures mount especially when combined with rising costs of locally available food and loss of opportunities to generate other income (Muia et al., 2021; Nikuze et al., 2019; Okafor, 2021). Hence, Kihoto is likely to remain a high-risk area for displacement.

However, we emphasize that environmental conditions are not the primary issue. Associating displacement outcomes with natural hazards often masks the socio-political origins of vulnerability (Oliver-Smith, 2013). In the context of Kihoto, the issue of land tenure and loss of *chamas* exemplify this: in the absence of support, those displaced from their permanent homes faced severe difficulties due to having to pay rent or take up high-interest loans to cope with the flooding of 2020. For others, the lack of protection for workers' rights, the seasonal and exploitative nature of work in the horticultural industry (Waweru, 2022), the lack of infrastructure, the limited support for businesses, and the absence of aid for those residing in the informal settlement all underpin instabilities that exacerbate vulnerability to displacement.

Housing, land tenure and the issue of resettlement

The issue of land tenure, housing and relocation following the 2020 flooding should also be highlighted. A study by Caron et al. (2014) underscored the need to recognize the continuum of land tenure arrangements prior to disaster and to strengthen land rights of the most vulnerable groups. Both are key to effective disaster response, reconstruction efforts and (re-)building long-term resilience for communities affected by disasters.

Caron et al. (2014) noted that relief approaches often ignore land claims and housing investments by those who may have held land informally or who lack documentation, finding that such approaches instead only focus on groups with documentation of prior land ownership. Secure land tenure is not a norm, and land claims and transactions are often informal and governed by alternative institutions. In Kihoto, community members and some national and local governments widely recognize land or plot ownership. Yet efforts to resettle people do not recognize informal rights of second or third generation plot owners. Frustrations linked to relocation after the disaster came up during the focus group discussions with women, during which participants stated that some government officials promised houses in Kayole area to plot owners, but when they arrived, no houses were available and the information shared was highly inconsistent.

Furthermore, only 4% of the 201 respondents to our surveys consider relocation from Kihoto as a solution, and nearly half of the respondents said they would prefer exploring potential infrastructural and sustainable development solutions to mitigate flood impacts (25% and 14%, respectively). This aligns with other research suggesting that even those displaced and routinely affected by disasters tend to maintain a strong place-based sense of belonging and will actively seek to avoid permanent relocation, despite challenging circumstances – even when facing the risk of death (Anton & Lawrence, 2014; Farbotko et al., 2016; Leighton, 2012; Marino & Lazrus, 2015).

As long as I am moved to a place where I can grow financially, I will go.

– Community member from the focus group discussion for people with disabilities

Suggestions for vulnerability reduction

Informal settlements such as Kihoto tend to remain especially invisible and neglected among larger urban areas. Although some residents of Kihoto have already adapted to changes over the past several years, both from lake level rise and flooding and the coronavirus pandemic, many still have limited resources and continue to lack official support and financial capital to pursue sustainable livelihoods.

It is important to consider the structural issues underpinning the local economy. The conversion of wetlands and urban expansion into flood-prone areas in Kihoto can be argued to have been driven by a disadvantageous dependency on the global economy – for example, growing flowers and other plants to sell to a global market, or relying on tourism from elsewhere in the region or beyond. Fluctuations in these larger regional and global economies continue to enforce structural inequalities and further marginalize those in poverty who do not have the option to renegotiate their circumstances (Mutisya, 2012). Therefore, debates about livelihood resilience must recognize that diversification beyond flower farms and tourism is required to meaningfully reduce poverty and vulnerability to displacement.

Exploring and supporting local *chamas* as a source of added protection and resilience against livelihood loss may also be useful. During the COVID-19 pandemic, a study in Nigeria found that households with women-led savings groups were less likely to face food insecurities and had more financial resilience to cope with the impacts of the crisis (Redford & Verhoef, 2022). They have also been used to provide insurance and distribute emergency support, thus acting as a source of social protection in places where financial resources are otherwise limited (Redford & Verhoef, 2022). While the *chamas* in Kihoto were not resilient to the 2020 flooding, strengthening and guiding guiding investment priorities toward risk and vulnerability reduction may translate into financial resilience in the longer term, and thus protect people from displacement risks.

Improving risk management requires a better understanding of the spatial extent of potential lake level rise in the future. Understanding the phenomenon can help to determine whether infrastructural solutions and ecosystem-based innovation, such as natural flood barriers, can be effectively implemented or if relocations will become necessary. If relocation is determined to be unavoidable, the process should then be planned properly in coordination with those affected, with clear and transparent guidelines.

To address the issues of relocation, tenure and housing in informal settlements in general, involving the local community in decision-making through co-production approaches could provide a solution. For example, “planning with urban informality” and potential relocation might be possible by exploring the local context with stakeholders, to understand their ways of living, future needs and diverse knowledge systems. Such work has been effective in informal settlements of Surakarta in Central Java, Indonesia, where relocations of squatters from flood-prone areas were planned with the community to deliver a functioning “people’s economy”, stable transport system, and sustainable urban development strategy (Song, 2016).

Knowledge co-production can also be leveraged to explore and uncover livelihood adaptation pathways by empowering local decision-making (Hill et al., 2020) and to support the delivery of services in informal settlements toward inclusive governance (Otsuki, 2016; Siame & Watson, 2022). Citizen engagement has also been utilized to support hydrological monitoring in Kenya. To reduce costs of monitoring, citizens were involved in a data collection process, with the distribution of water level gauges and training, resulting in high quality hydrological data even from remote water catchments (Weeser et al., 2018).

However, co-production should not entirely replace the need for official recognition, support and resources in Kihoto. Indeed, it can complement planning in an informal context, but development and enforcement of existing policies (such as the Lake Naivasha Catchment Protection Order, 2012) is also necessary to discourage building of structures and the expansion farming activities in highly sensitive areas (Karanje, 2022). Similarly, the need for basic services, infrastructure and safe housing cannot be fulfilled without adequate investments to support community resilience and poverty reduction.

At a global scale, institutional preparedness (i.e. research, policies and resources) is lacking to manage relocation and associated rehabilitation sustainably (Leighton, 2012; Nikuze et al., 2019; Oliver-Smith, 1991). We see at a local scale that such preparedness is also missing.

Our study revealed significant shortfalls in the official capacity to deliver response and relief in association with the 2020 flooding in Kihoto. Only some of our respondents received early warnings, and despite the scale of the impacts of the flooding, almost no one (96%) received official support from the local government (aid, financial assistance or psychosocial support). Moreover, very little support was provided for temporary relocation, and most of those displaced relied on their social networks to cope with the impacts of the flooding disaster. This demonstrates a widespread and multidimensional protection gap (Bradley & Cohen, 2010) affecting Kihoto, which in turn is worsened by the lack of support for those displaced. Indeed, the risk of poverty cycles and fractured social ties are currently unmanaged concerns, and thus these risks can generate new forms of vulnerabilities for the future.

Despite the absence of official responses, the local community has mobilized to support the most vulnerable. For example, families and friends have supported each other for years after the 2020 floods. In the immediate aftermath, young people in Kihoto organized a rapid response to support the evacuation; this corresponds to other research that contests depictions of disasters as chaotic and characterized by panic. Instead, people tend to generate a self-organizing voluntary response among communities that is rarely incorporated into formal planning (Twigg & Mosel, 2017).

Thus, instead of relying on a centralized response alone, it is possible to begin supporting communities in response and protection through capacity development. This may also be a strength: local response may arrive hours before any professional emergency teams (Twigg & Mosel, 2017). Such an approach can complement expert-led disaster risk reduction interventions and mitigate the problems of top-down solutions that often sideline local communities' opinions (Gaillard, 2010; Wisner, 2020).

However, the primary focus should remain on disaster risk reduction. As pointed out by many (Blaikie et al., 2004; Gaillard, 2010; Oliver-Smith, 2013; Wisner, 2020), the success of risk mitigation usually lies in vulnerability reduction, referring to activities that would strengthen people's livelihoods, reduce poverty, support access to healthcare and basic services, and so forth. Therefore, the need for services, safe housing and safe water supplies should be rapidly prioritized. Yet the risk remains that these issues will go unaddressed, given that Kihoto is an informal settlement, characterized by its lack of infrastructure. As such, it may not be perceived as "worthy" of investment: as Jayawardhan (2017) pointed out, cost-benefit analysis-based mitigation and protection measures often focus on property values to demonstrate their need and impact. As a result, marginalized and disadvantaged communities may be excluded from protection decisions. A well-planned and jointly owned risk governance approach is therefore urgently needed, in consideration of the community's needs.

4.2 Reshaped vulnerabilities

The majority of respondents to our surveys thought that their livelihoods, housing and security were worsened and had yet to recover, almost three years after the 2020 flooding event at Lake Naivasha. Continued loss of access to services (water supply, sanitation and electricity) and healthcare was reported, by more than half of the respondents.

These are significant issues in an area already lacking basic infrastructure and services. Considering their centrality to resilience against disaster impacts, these vulnerabilities could be made worse due to lack of recovery and associated displacement outcomes. When combined with the finding that 96% of all those interviewed did not receive psychological support from any official source, it is likely that those affected by displacement Kihoto face an exacerbated risk to well-being.

As discussed by Nikuze et al. (2019) in the Rwandan context, loss of social networks often follows displacement and resettlement processes. Given that social capital is important for supporting livelihoods and finding opportunities, the decline of social connections due to displacement may lead to loss of social security (Uzelac et al., 2018). Weak social capital also limits the ability of those displaced to find work (Jacobs & Paviotti, 2017). In Nakuru and Uasin Gishu, Kenya, research showed that an affiliation with community organizations tended to be associated with a positive impact on households' livelihoods and welfare outcomes for internally displaced people, and vice versa (Kiboro, 2017).

In the case of Kihoto, we found that the loss of *chamas* had severe exacerbating impacts on financial stability at local levels. People lost social connections, which affected their sense of community security and psychosocial well-being, according to their self-reporting. They likely lost opportunities to improve livelihoods with the loss of social connections, which would have provided information about suitable crops or savings through *chamas* that had become non-functional.

Figure 9. Comparison of Lake Naivasha's surface extent in 2013 and 2020



Source: Regional Centre for Mapping of Resources for Development (RCMRD) (2021)

Vulnerabilities are also reshaped by other environmental changes. We further investigated our unexpected findings regarding increasing salinity of the soils in the area following the 2020 floods. Despite Naivasha being a freshwater lake, numerous respondents in Kihoto reported that farming is becoming increasingly challenging due to salinized soils, which cannot provide adequate yields for farmers. Considering the extent of flooding in 2020, it is possible that Lake Naivasha became connected to the highly saline Lake Oloidien (Figure 9) (Regional Centre for Mapping of Resources for Development (RCMRD), 2021). Whatever the case may be, a more detailed examination into soil viability in the future is necessary.

5. Conclusion

By outlining and mapping pre-displacement vulnerability concerns and post-displacement impacts in relation to the 2020 floods in Kihoto, we provide here a holistic overview of the impacts that the water level rise of Lake Naivasha may have on Kihoto, the informal settlement on the lakeshore, and by extension, on communities that may be impacted by water level rise in other lakes across the East African Rift Valley. Here we provide some suggestions for policy responses, actions required to protect Kihoto, and ways to maximize effectiveness when facing mounting risks and uncertain futures.

The loss of housing, livelihoods and basic services in Kihoto after the 2020 flood event provided evidence of underlying socio-economic and political marginalization that can exacerbate displacement risks. Displacement was worsened by the lack of basic infrastructure dependency on sensitive and unstable livelihoods, lack of support for evacuation and unplanned temporary resettlement. Displacement was combined with loss of income due to destroyed flower farms, agricultural fields and businesses, as well as the absence of tourism, a field that was already struggling due to the COVID-19 pandemic. Overall, these impacts of the 2020 floods left most of the respondents to our surveys unable to recover from the disaster and their displacement. At the same time, fracturing of the social fabric, loss of *chamas* and increased costs of living due to renting and the increasing price of basic goods have worsened well-being and economic insecurity, which in turn continue to feed new vulnerabilities to natural hazards.

Parallel to these concerns, limited official support to manage response, recovery and rehabilitation meant that Kihoto residents remained disadvantaged, three years after the initial disaster and ensuing displacement. The majority of our respondents relied on their families, apart from the elderly who were found to suffer from social isolation and lack of support. And while the community had organized to deliver responses to the disaster, the absence of holistic disaster and vulnerability reduction measures continues to exacerbate risks. Little has been done to prevent poverty traps, improve sanitation and services, or secure livelihoods from environmental hazards.

Based on this information, we provide some central recommendations that can help Kihoto. These also could support wider decision-making as it pertains to the rising water levels in the major lakes across the East African Rift Valley:

More research is required on disaster displacement and underlying environmental hazards. In the absence of information that would accurately estimate the potential for future floods as Lake Naivasha changes, it is difficult to make informed decisions. Given this uncertainty, it is necessary to further detail the socio-economic dynamics and how they contribute to vulnerabilities across different groups in the face of natural hazards, in order to support prioritization of investments. Similarly, research is required to determine the reason behind changes in Lake Naivasha's increased salinity. These findings could inform relocation, livelihood diversification, adaptation and risk reduction efforts.

The area's economic dependency on highly sensitive industries needs to be addressed. Given that the largest employers in the region are horticulture, agriculture and tourism, which are all highly exposed and sensitive to hydrometeorological hazards, there is an urgent need to begin exploring options for diversifying local livelihoods. Diversification must also take into account global and regional economic pressures.

Make a commitment to knowledge co-production and inclusive governance. These methods help to identify viable options for livelihood diversification and risk reduction with local stakeholders. These discussions must be held with the people of Kihoto to ensure that their socio-economic and cultural needs are met and respected across the phases of adaptation. Communities can also be involved in monitoring the water level rise and take part in designing a sustainable development plan for the community. Alternatively, if relocation becomes unavoidable, the negotiation regarding new sites, new livelihoods and reskilling must be discussed to guarantee that no one is left behind or further marginalized by the process.

Invest in basic infrastructure. This priority can protect people from disaster impacts and help to support their recovery from displacement. Lack of sanitation, for example, which leads to spread of communicable diseases especially during flooding, would be good starting points to address current vulnerabilities contributing to risks.

Kihoto must be supported with robust disaster management and risk reduction planning. To alleviate suffering in pre-and post-disaster phases, the settlement must have a well-established early warning system, well-coordinated response mechanism, and plans for "building back better" toward increased resilience. Upskilling and training local responders and community organizations is one immediate and low-cost solution that can be prioritized now.

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Annex I. Household survey

Household Questionnaire – Naivasha case study

Introduction

Good morning/ afternoon. My name is _____ I am conducting this study on behalf of the Stockholm Environment Institute (SEI) who are undertaking a research project on “*Disaster displacement in cities: vulnerability factors and implications for local policymaking*”. The aim of this research is to strengthen the understanding of particularities of disaster displacement in urban settings with a particular focus on Kihoto settlement in Naivasha. The information given here is confidential, it will be treated with ultimate confidentiality and will be used for the purpose of this research and to inform future studies. You are being invited to participate in this research because you are considered as having vital information and opinions relevant to achieve the objectives of the study. Please confirm that you have read the project information sheet and signed the consent form before proceeding.

☐ I agree to participate in the study

☐ I am not willing to participate in the study

Interview ID _____ -- _____ -- _____ Date: ____/____/____

Interviewer _____ Location: _____

Coordinates: _____ Ward: _____

Sub-County: _____ Centre: _____

Section One: Respondents Background

1. Housing Structure and Material

☐ Temporary (Clay/Mud/Wood/Iron Sheets)

☐ Semi-permanent (Clay/Mud/Wood/Iron Sheets)

☐ Permanent (Concrete/Bricks)

☐ 99. N/A [Circle if the interview is not conducted in the respondent's home]

2. Sex of respondent

- ☐ Female ☐ Male ☐ Other

3. Civil/Marital Status:

- ☐ Never Married/Single ☐ Married Monogamous ☐ Separated
☐ Married Polygamous ☐ Widowed ☐ Divorced
☐ Other

4. Respondent Age bracket: _

- ☐ 18-35 ☐ 35-45 ☐ 46-55 ☐ 60 Tears and above

5. Do you identify as a person living with disability (visual, hearing, mobility, cognition, selfcare and communication)?

- ☐ Yes ☐ No

6. What is your current occupation/source of livelihood? _____

- ☐ Business ☐ Formal Employment ☐ Non-formal Employment
☐ Not Employed

7. What is the highest level of formal education you have attended?

- ☐ No formal education ☐ Primary school ☐ Secondary
☐ Technical ☐ University ☐ Other

Section Two: Explore the factors that make people vulnerable to disaster displacement.

8. How long have you lived in this location?

- ☐ Since birth ☐ Less than 5 years ☐ 5-10 years ☐ 10 years and above

9. If not since birth, did you move here voluntarily or were you forced to move from where you previously resided?

- ☐ I moved here voluntarily ☐ I was forced to move

10. If you were forced to move, what reasons forced you to leave?

- ☐ **Social reasons:** (marriage, family, discrimination, insecurity, inadequate services, other)

☐ **Economic reasons:** (not enough income, unreliable harvest, no land available for farming, crop failure, unemployment, job opportunity in new place, other)

☐ **Environmental reasons:** (Water shortage, repeated droughts, floods, landslides, other)

☐ **Political reasons:** (violent conflict, persecution, seek political freedom, incentives provided by government, forced movement by government, other)

11. What was your job/ source of income?

- ☐ Agricultural produce ☐ Businesses ☐ Non-farm produce
- ☐ Formal employment e.g civil servant ☐ Casuals ☐ Other

12. Did you own land/properties where you lived?

- ☐ Yes ☐ No

13. Did you have any previous displacements?

- ☐ Yes ☐ No ☐ If yes, how many?

14. Where did you move to when you were forced or obliged to move?

- ☐ Within the Naivasha Municipality ☐ Outside the Naivasha Municipality but within Nakuru County
- ☐ Other parts of the country

15. What was the effect of the disaster?

- ☐ Destruction of houses ☐ Businesses were destroyed ☐ Death of family members

16. What areas (land uses) were particularly affected by the cause of displacement?

- ☐ Transportation (Road network) ☐ Residential ☐ Agricultural land

17. Which groups or members of the community were particularly affected by disaster?? Why?

- ☐ The elderly ☐ Women and Children ☐ Youth
- ☐ Persons living with disabilities (PWDs) ☐ Migrants/Refugees ☐ Men ☐ Others

18. In your opinion, what do you think makes people particularly vulnerable to hazards?

- ☐ Age ☐ Income ☐ Ethnicity ☐ Home ownership
- ☐ Sexual orientation ☐ Family size ☐ Health and disability status ☐ Religion

19. Before you were displaced, was there any early warnings prior to the disaster?

- ☐ Yes ☐ No

19a. If yes, how did you receive the information?

- Cell phone (SMS)
- Outdoor public warning systems
- Organizational emergency alert systems
- Local media such as radio and TV
- Internet/social media
- Other

Section Three: How does displacement exacerbate existing vulnerabilities and creates new ones?

20. Did you get any employment after the displacement?

- ☐ Yes ☐ No ☐ If No, why?

21. How have these areas of your life changed after the displacement? (Are they better or worse)

Area	Worse	Better (improved)
Housing conditions		
Livelihood		
Security		
Healthcare		
Education		
Access to other services e.g water supply, sanitation, electricity		
Family Relationships and beyond		

22. When you were displaced from your original home, did you/have you received any financial support from:

- ☐ Friends or Family ☐ Political Institutions
- ☐ Humanitarian organizations ☐ Local/National Government

23. Are you currently part of a group/ organization?

- ☐ Yes ☐ No ☐ If yes, which one? How has it helped you?

24. What have been the most important factors that have helped you to cope and adapt to the new circumstances after the displacement? (Question could be open with some exemplification:

- ☐ Supportive family ☐ local organization ☐ Communities of faith
- ☐ Community involvement ☐ Seeking psychological help ☐ Other
- ☐ Cultural rituals ☐ Diversifying the sources of income

25. In your opinion, do you think the community has changed over the years?

- ☐ Yes ☐ No ☐ If yes, how?

Section Four: Addressing Disaster Displacement in Urban Areas- Responses

26. To your knowledge, do you know any public institutions/ organizations that oversee displacement issues and relocation?

- ☐ Yes ☐ No

☐ If yes, have you contacted any of them?

27. Are you aware/part of any local program that addresses poverty, displacement or environmental issues?

- ☐ Yes ☐ No ☐ If yes, which?

28. Do you think the programs implemented to address poverty, displacement, and environmental issues have been adequate?

☐ Yes, please explain

☐ No, please explain

29. To your knowledge, are members of the community usually included in any planning processes or decision-making processes?

- ☐ Yes ☐ No

30. In your opinion, what should be done to prevent displacement or climate-related communal endangerment?

31. Have you heard any plans to make housing or land available for the evacuation or relocation of vulnerable communities?

- ☐ Yes ☐ No ☐ If yes, specify

32. Is there a disaster response system, in your community?

- ☐ Yes ☐ No

33a. If yes, which ones?

33. To your knowledge, are there any emergency shelters located in your community?

- ☐ Yes ☐ No

☐ If yes, do you know, their capacity and how well are they equipped?

Thank you for taking your time to respond to these questions!

Annex II. Business survey

Business Questionnaire – Naivasha case study

Introduction

Good morning/ afternoon. My name is _____ I am conducting this study on behalf of the Stockholm Environment Institute (SEI) who are undertaking a research project on “*Disaster displacement in cities: vulnerability factors and implications for local policymaking*”. The aim of this research is to strengthen the understanding of particularities of disaster displacement in urban settings with a particular focus on Kihoto settlement in Naivasha. The information given here is confidential, it will be treated with ultimate confidentiality and will be used for the purpose of this research and to inform future studies. You are being invited to participate in this research because you are considered as having vital information and opinions relevant to achieve the objectives of the study. Please confirm that you have read the project information sheet and signed the consent form before proceeding.

☐ I agree to participate in the study

☐ I am not willing to participate in the study

Interview ID _____ -- _____ -- _____ Date: ____/____/____

Interviewer _____ Location: _____

Coordinates: _____ Ward: _____

Sub-County: _____ Centre: _____

BASIC INFORMATION

1. Sex of respondent

☐ Female ☐ Male ☐ Other

2. Respondent Age bracket: _

☐ 18-35 ☐ 35-45 ☐ 46-55 ☐ 60 Tears and above

3. What is the highest level of formal education you have attended?

☐ No formal education ☐ Primary school ☐ Secondary
☐ Technical ☐ University ☐ Other

4. Type of business (include multiple businesses where applicable)

☐ Commodity (Trade) based business (Shop, grocery, retail, wholesale etc) ☐ Manufacturing (Tailoring welding etc) ☐ Service-based business (Salon, mechanic, laundry, transport)

BUSINESS DEVELOPMENT

1. How long have you operated the business in this area? (*No. of years/since year/ based on ability of respondent to respond appropriately*)

2. What made you decide to start the business here? 1. Presence of large purchasing power in the town
2. Lack of other means of livelihood 3. Large demand for services I offer 4. Ease of doing business
5. Others (specify)

3. Average daily business income 1. < 100 2. 100- 500 3. 501 – 1000 4. 1001 – 1500 5. 1501 – 2000 5. 2001 – 5000 6. 5001-10,000 7. > 10,000

4. Major clients for business (*select all that apply to your various businesses*)

1. Local community members 2. County/National government staff 5. Local tourists
4. Foreign tourists 5. Others 6. (Specify)

5. Have you ever practiced a different kind of business? 1. Yes 2. No

6. If yes, describe the previous business

7. (If yes) What made you venture into the current business/what made you change from previous business/ activity?
.....
.....

8. How has the location in the area impacted on your business? .

1. Increased profits, 2. Expanded business to include new establishments 3. No change 4. Others (specify)
.....

9. Where have you sourced the employees from? (**multiple responses allowed**)

☐ From the local community (from within Kihoto) ☐ From Naivasha County ☐ Other (Specify)

10. What opportunities exist in this area for business development?

☐ Growing population ☐ Security ☐ Presence of financial assistance opportunities ☐ High purchasing power ☐ Favourable tax/permit regimes ☐ Ease of acquiring licenses 6. Others (specify)

11. How have you utilized the existing opportunities?

☐ Expanded same business to other areas (specify target locations) ☐ Started new forms of businesses (specify type of business) ☐ Expanded size of current business within same area/location ☐ Others (specify)

12. What challenges do you face in your business?

☐ Natural disasters ☐ Lack of goods, ☐ Lack of capital, ☐ Insecurity, ☐ Complex taxation/permit issuance systems ☐ Expensive license fees ☐ Others (specify)

13. What kind of space did you start operating your business in?

☐ Open space ☐ Small rack outside house ☐ Modified room within house ☐ Special dedicated business premises (eg shop) ☐ Rented shop/ Stall/ Makeshift Kiosk ☐ Other (specify)

14. What type of business premises ownership arrangement do you have?

☐ Rented ☐ Owns the business premise ☐ Makeshift structure. ☐ Other (Specify)

Risk -averse

15. What do you perceive as the greatest disaster threat to your business?

☐ Flood ☐ Fire ☐ "Man-made" disasters such as thefts, ☐ Other

16. What could be the probability in percentage basis that a disaster will happen in Kihoto within the next 10 years?

☐ Less than 50% ☐ More than 50%

17. What could be the probability in percentage that your business will be damaged from this disaster?

☐ Less than 50% ☐ More than 50%

18. How long would it take you to reopen your business after disruption from a disaster?

☐ Instantly ☐ One week ☐ Two weeks ☐ More than a month ☐ Not sure ☐ I would not be able to reopen ☐ Other

19. What level of responsibility does each of the following institutions have on protecting you and your business from disasters?

	Not at all responsible	Very responsible
Myself		
Media		
County government		
National government		
International community		
Private investors		
Other		

20. Have you ever attended meetings or received written information on disaster preparedness?

☐ Yes ☐ No

21. Do you think that you have adequate knowledge about protecting yourself and your business from disasters?

☐ Yes ☐ No

FUTURE ASPIRATIONS/EXPECTATIONS

22. What are your business aspirations for the next 5 – 10 years? (*responses can include Enhancing my business, Educating my children, Owning a better house*

23. What services and facilities would you like to be provided in Kihoto?

.....

24. Which of the existing services, facilities and amenities would you like to be improved?

.....

25. Where do you think the county government can improve service delivery.

.....

Thank you for taking your time to respond to these questions!

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