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Impacts of Landslides on Residents Living in The Disaster-Prone Areas of Murang'a County, Kenya

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Abstract
Landslides are projected to increase in the future due to population pressure and associated land-use changes exacerbated by climate change in the tropics. Studies about the impacts of landslides pay much attention to the negative effects at the expense of any positivity. This qualitative study seeks to fill the gap by focusing on both the positive and negative impacts of landslides in Murang'a County through descriptive statistics and narrative analysis. Primary data was collected through Household (HH) questionnaires, Focus Group Discussions (FGD), and Interview schedules. The sample size is 393 proportionate HHs in the study area, with a total population of 85,895 people distributed over 26,201 HHs. A total of 8 key informant interviews were conducted alongside 6 FGD. An overwhelming count of 97 percent of local people considered landslides as disasters, and 88.7 percent said that there has been an increase in cases over time. Importantly, 80.8 percent of those who testified to have experienced a landslide (94.3%) reported a landslide at close proximity of less than 1 kilometre from their homes. A significant 92.3 percent of the landslide cases were reported to have caused damages ranging from destruction of properties, displacements, loss of human life and animals, and psychological stress, among others. Prominent negative impacts of landslides are psychological effects reported by 63.4 percent of the affected respondents. Other adverse effects included loss of properties, displacements, deaths, and loss of animals and crops. The positive impacts include monetary gains for the affected residents, income for absentee house owners, and rebuilding resilient infrastructures. The study concludes that landslide disasters in the prone areas of Murang'a County result in both negative and positive impacts. The impacts of landslides on residents living in prone areas indicated more pronounced negative effects compared to the positive ones. Therefore, the study concludes that efforts by different stakeholders should be put in place to minimize the adverse effects of landslides. Both county and national governments should have an all-inclusive disaster management programme involving the residents who are directly impacted.
Keywords: climate change, landslides, impacts, landslides, Murang'a County

Introduction

Globally, landslides cause huge losses, but the study on causalities and other effects are 'hugely under-estimated and not complete' (Haque et al., 2016), more so in Africa, which is a continent that is under-represented in landslide research (Broeckx et al., 2018). This is against the fact that landslides are projected to increase in the future due to population pressure and associated land-use changes exacerbated by climate change in the tropics (Monsieurs et al., 2018). Regionally, East Africa has reported major landslides (Ngecu et al., 2004), and Kenya is indeed characterized as a disaster-prone country (Republic of Kenya, 2010). Like many areas of the world, particularly

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in tropical developing countries, Kenya is at risk of landslides and their associated effects (Anderson et al., 2013). Landslide disasters are not new phenomena in Kenya (Davies, 1996; Salome et al., 2004; Wahlstrand, 2015). Specific cases have been reported to occur in the central highlands, eastern and rift valley, with specific cases in among other areas in Elgeyo Marakwet County (Aseta, 2018; Loice et al., 2021), Mount Elgon and Nandi (Maina-Gichaba et al., 2013), slopes of Mount Kenya, Kisii, Kibwezi (Ngecu & Mathu, 1999) and Central Highlands (Mwaniki, et al., 2017).

Kenya is a disaster-prone country, and landslides are among the deadliest and most recent recurrent disasters in Murang'a County (Salome et al., 2004), courtesy of the favourable causal/trigger factors. The recurrent landslides have caused injuries, deaths, disruptions, and displacements of people and property in the area. Studies about landslide effects pay much attention to the negative effects of landslides at the expense of any positive contributions of the occurrences in an area. This is a research gap that this study seeks to bridge by studying both the positive and negative impacts of landslide disasters. The general objective of this study was to assess the impacts of landslide disasters on residents of Murang'a County, Kenya. The research question that the study sought to answer was, therefore, on the positive and negative impacts of landslide disasters on the residents of Murang'a County, Kenya

It was necessary to carry out this study because information about landslides and the resultant effects at global, regional, and local scales was found to be scanty (Van Westen, 2006). This is probably due to the fact that damages emanating from landslides are perceived to be relatively fewer compared to other disasters. Another possible reason for that is the fact that in most cases, damages from landslides are 'opaque' as landslides are normally triggered by or occur in combination with other disasters such as earthquakes and floods (Ciurean et al., 2013), which makes it difficult to isolate the effects of specific disasters from the landslides. According to Davies (1996), Wahlstrand (2015), and Zhou et al. (2020), there is a dearth of information about landslide disasters in Kenya. Additionally, available literature shows that studies about the impacts of landslides pay much attention to the negative effects of the disasters at the expense of any positivity. This study thus seeks to fill the gap in the literature on the impacts of landslide disasters by highlighting the eminent losses and benefits from a landslide disaster in Murang'a County.

Murang'a County Geo-meteorological Hazards Profile

According to Murang'a County Disaster Management Directorate (2021), the county has had many reported disasters over time, as depicted in Table 1. Landslides are unique and noticeable because they are recurrent and affect 6 out of the 7 sub-counties of Murang'a County. For instance, in the year 2018, all the sub-counties (Kigumo, Kahuro/Kiharu, Gatanga, Mathioya, Kangema, and Kandara) except Maragwa reported serious landslide cases. Landslides have occurred due to excessive rainfall, dissected topography, favourable soil types, and excessive anthropogenic activities on land courtesy of increasing population (Maina-Gichaba et al., 2013). Available statistics on landslide inventories for the years between 1990 and 2021 show that the county witnessed the highest number of landslides in the years 1997 and 2018 due to enhanced rainfalls. The landslides caused huge losses (Njiraini et al., 2022).

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Table 1: Murang'a County geo-meteorological Hazards and Their Associated Effects

Risk Type	Place of Occurrence	Causes of Threat	Brief Information on The Degree of Severity and History of The Hazard
Landslides and mudslides	Kigumo, Kahuro, Gatanga, Kiharu, Mathioya, Kangema Kandara	1. Excessive rainfall 2. Dissected topography 3. Soil erosion, 4. Human activity	The county has a history of landslides and mudslides. However, due to climate change and the increase in population since 2016, the county reports numerous landslides in each rainfall season, leading to loss of lives, destruction of property, and displacement of people, among other things.
Drought	Lower zone of Murang'a	Erratic and unpredictable rainfall	Due to climate change and variability, farmers have incurred loss of crops and pasture
Food insecurity	Lower Gatanga, Maragua and Kiharu	1. Pests and diseases, Fall armyworm 2. Drought and other extreme weather conditions 3. Climate change and variability; 4. Poor Post-Harvest management practices, 5. Change of agricultural land to residential due to increase in urbanization and industrialization, 6. Lack of legal framework and implementation	Due to the effects of climate change, poor attitude towards farming, and the geographical features of the county.

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Flash/ flooding	Urban centres due to poor planning River flooding due to excess rainfall in Lower Kiharu, Mathioya, Gatanga and Maragua	1. Poor planning in urban centres and 2. River flooding due to high rainfall and farming in riparian areas	There has been an increase in flooding leading to displacement of people, loss of crops and livelihood
Drowning	Countywide	1. Natural causes 2. Technical errors 3. Human errors	Cases rise during the rainy season and also as a result of mental health issues.
Fire hazards (both structural and wildfires)	Countywide	1. Arson 2. Human error 3. Technical error 4. Non-compliance 5. Natural causes 6. International situation 7. Lack of legal basis and supervision	According to a recent survey of forest fires, unkept forests and poaching threaten our indigenous forests. School fires are on a new surge due to student unrest. Urbanization.
Road Traffic Accidents	Countywide	1. Human error 2. Technical errors 3. Non-compliance 4. Natural causes 5. Topography	The topography our county causes contributes to high cases of this hazard. Most roads have inadequate traffic signage. Road users' attitude.

Source: Murang'a County Disaster Management Directorate (2021)

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Impacts of Landslide Disasters

Information about landslides and their resultant effects at global, regional, and local scales is scanty. Nevertheless, one of the important indicators of the impacts is the effects on elements at risk (van Westen, 2006). Unfortunately, damages emanating from landslides are perceived to be relatively fewer compared to other disasters due to the fact that, in most cases, damages from landslides are opaque as landslides are normally triggered by or occur in combination with other disasters such as earthquakes and floods (Ciurean et al., 2013). As a result, landslide economic losses have been characterized as direct or indirect (Ngecu & Ichang'i, 1999; Ngecu & Mathu, 1999; Schuster & Highland, 2001). The direct losses are the immediate destruction and damages to the property, land, and other developments. At the same time, the indirect losses are the resultant losses from the direct losses, which include, among others, depreciation of land, loss of tax, reduced agricultural productivity, traffic/river interruptions, and psychological trauma on those affected (Knapen et al., 2006; Kitutu et al., 2009).

Murang'a County has recently experienced serious, deadly, and recurrent landslides. The landslides have previously caused injuries, deaths, disruption, and displacement of people's lives and property (Mwaniki et al., 2011). Some of the major landslides reported in Murang'a have been documented here. On 15th May 1991, in Gacharage Village, a landslide buried a house near a cliff top, killing all eight residents in their sleep and destroying an estimated 10,000 US dollars' worth of property (Davies & Nyambok, 1992). On 30th April 1997, in Maringa Village, a landslide buried three houses, killed eleven occupants, and destroyed their three semi-permanent houses, leading to a loss of property worth thousands of US dollars (Ngecu & Ichang'i, 1999). Also, on 26th November 1997, a deadly landslide occurred in Gatara Village and caused the deaths of three people and the destruction of tea plantations (Ngecu et al., 2004). In the same year (on 10th November 1997), a landslide occurred along Murang'a-Thika highway at Karugia. It swept away a 1 km section of the highway, affecting 25 hectares of agricultural land and disrupting the telecommunication network (Ngecu & Mathu, 1999).

According to the Kenya Meteorological Department (KMD, 2021), residents of Kiriko-ini village, in Gatuya Location, Murarandia Division of Murang'a County narrated that huge cracks appeared on most farm lands and homesteads on 1st February 2012. Houses were damaged, and others were rendered inhabitable as huge cracks appeared on the walls and the floor of the affected houses. Some portions of farmlands appeared to have sunk or shifted downslope. In the same year, on 1/4/2013, a landslide occurred in Gitiri Village, Kahuro Division where a household was affected when iron sheets of their houses were destroyed during the slide. Luckily, no injuries were reported. Nevertheless, chances of a bigger landslide loomed, and the families were advised by government officials from the Department of Environment to plant trees and grass on the landslide slope to prevent further soil movement downwards. The two most recent landslide cases were reported by The Star Newspaper (unpublished April 28, 2018). One occurred at Inooi Kianda gia Ithanwa Village in Kahuro Sub-County in Kiharu, in which three people were killed and a house was swept away, while the second one was at Kahwai Village within Gitugi Ward in Mathioya Sub-County in which three farms were swept away.

Positive Versus Negative Landslide Impacts

Landslides are serious geologic disasters that cause more serious damages than are generally recognized (Maina-Gichaba et al., 2013), ranging from the destruction of humans, property, and traffic to structures. Landslides are defined as serious geologic disasters that cause destruction to humans, property, traffic, and structures (Yufeng & Fengxiang, 2009). Studies about landslide effects pay much attention to the negative effects of landslides at the expense of any positive contributions of the occurrences in an area. This is a research gap that this study

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seeks to address by also discussing and highlighting the eminent benefits of a landslide disaster. Unfortunately, some of the positive effects are easily turned into negative effects by the people in the society through their irrational actions, such as the diversion of funds meant for activities such as relief and reconstruction in the post-landslide disaster phase.

Methodology

The study area is located in Kenya, a country which is in East Africa, and lies approximately between Eastings 34^{o} and 42^{o} and Northings 4^{o} 22' and -4^{0} 28' (see Figure 1). Murang'a County is one of the five counties of the former Central Province and is county number 21. The county is spatially expansive, spanning from an alpine zone defined by a tropical forest called the Aberdare Forest to semi-arid zones bordering Machakos and Embu Counties. The altitude ranges from 914 meters ASL in the lowlands East and 3,354 meters

Research design is important in any research as it indicates the framework of data collection, analysis, and priorities given to the research process (Bryman, 2016). This study's research design was qualitative, and data was collected using Household (HH) questionnaires, Key Informants (KII), and Focus Group (FGD) discussions.

For the primary data, household (HH) questionnaires were administered within the purposively selected study sub-counties noted to have had serious cases of landslides. The sub-counties are Kangema, Mathioya, Kigumo, Kandara, Kiharu/Kahuro, and Gatanga. A computed sample size of 393 proportionate HHs was sampled in the study area, with a total population of 85,895 people distributed over 26,201 HHs (KNBS, Volume II, 2019). The sampling frame was the households where the questionnaire respondents were HH heads who were systematically selected for each study location after the kth number was computed, as shown in Table 2.

Table 2: Computation of the kth Number for the Study Location

Study Location	Total HHs	Proportionate HHs Sampled	kth number
Kihoya	1,984	57	1984/57=**35**
Rwathia	2,261	51	2261/51=**44**
Gitugi	2,308	50	2308/50=**46**
Kiru	3,266	37	3266/37=**88**
Murarandia	3,714	33	3714/33=**112**
Mariira	3,130	39	3130/39=**81**
Kinyona	2,440	48	2440/48=**51**
Kibage	4,870	26	4870/48=**188**
Mbugiti	2,228	52	2228/52=**43**
	26,201	**393**	

Source: KNBS, Volume II (2019)

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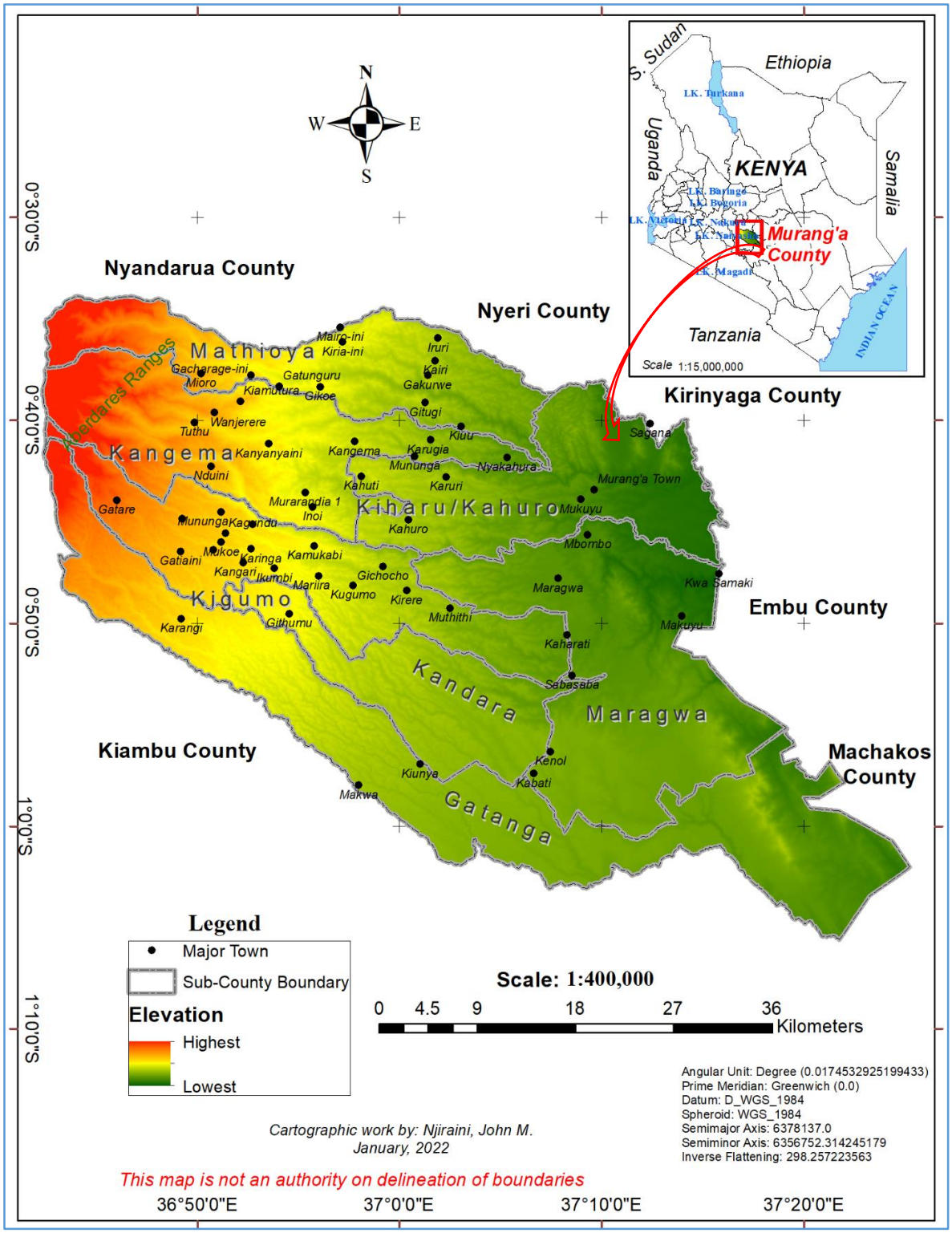

Fig. 1: Murang'a County, Kenya
Data from USGS (2015) and Google Earth (2021)

Key Informant Interviews (KII) were used to obtain first-hand and in-depth information from the local people (Shisanya, 2017). For this study, KIIs supplemented the HH questionnaires as they provided data that would not have been captured through the main questionnaires (Sapkota, 2017). KII has been used in similar studies, such as research on the role of traditional

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knowledge in botanical sustainable land management in Western Kenyan Highlands (Shisanya, 2017) and indigenous perception and strategies in climate change adaptation in rural Ghana (Cobbinah & Anane, 2016). A total of 8 KII were conducted on people with knowledge about the landslides. These included experts, administrators, and community leaders who were interviewed through structured interview guides. Each contributed significantly to data collection, as outlined in Table 3.

Table 3: Key Informants

KII	KII Category	Contributions
KII-1	County Director of Meteorological Services	Information on scientific understanding of weather/climate and landslide disasters
KII-2	County Commissioner	Information on population and landslide disasters at the county level
KII-3	Deputy County Commissioner	Information on population and local people's interaction and experiences with landslide disasters at the sub-county level
KII-4	Chief	Information on population and local people's interaction and experiences with landslide disasters at location level
KII-5	*Wazee wa mtaa**	Information on population and local people's interaction and experiences with landslide disasters at the grassroots
KII-6	Disaster management Directorate and county ministry of environment and climate change	Scientific and local people's information on landslide disasters: pre, post, and during disaster management
KII-7	Local Media (FM Station)	Scientific information on weather/climate and landslide disaster occurrences, preparedness, mitigation, early warning and information dissemination, and local people's interaction and experiences with landslide disasters
KII-8	Kenya Red-Cross	Information on landslide disasters, during and post disaster activities

Source: Author, 2021

Focus Group Discussion (FGD)

Notably, small cohorts of the population focused on specific areas of study yield valuable information (Shisanya, 2017). This is the reason for the study's choice of FGD data collection techniques. A total of 6 FGD sessions were conducted in the study locations. Each group was made up of 6 to 12 members, a number that is considered to be adequate in research (Lasch et al., 2010). The FGD were purposively selected, as shown in table 4.

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Table 4: Focus Group Discussion

Sub-county	FGD name	Composition	The kind of Data Generated
Kangema	Kangema Ranet FM and other experts	Media personality and experts from KMD and Kenya Red-cross, Murang'a Disaster Management team	History of landslides in terms of frequencies, post-disaster preparations and mitigations, effects, rescue, relief, reconstruction, and general information on landslides in Murang'a County.
Kandara	Witeithia women group	Local women	General information about landslides in terms of frequencies, causes, effects, interventions, landslide trends, and mitigations.
Mariira	Mariira tea growers	Peasant tea farmers	General information about landslides: frequency, trends, causes, effects, mitigations, and possible solutions.
Ndakaini	Ndakiani traders	Local business men and women	Information on effects of landslides on families, frequency of landslides, and possible solutions.
Rwathia	Rwathia leaders	Local leaders (chiefs, assistance chief and *wazee wa nyumba kumi*	History of landslides in terms of frequencies, post-disaster preparations and mitigations, effects, rescue, relief, reconstruction, applicable EWS
Murarandia	Murarandia men and youth leaders	Men and youth leaders	Effects of landslides on families, possible mitigations and solutions to the adverse landslide effects

Source: Author, 2021

Data Collection Procedures and Ethical Considerations

The study upholds moral and ethical considerations in data confidentiality, anonymity, security, and freedom from physical or mental harm or discomfort during the acquisition, processing, and presentation. To accomplish these, research permits and authorization were sought from the relevant authorities, in this case from the National Commission for Science, Technology, and Innovation (NACOSTI), which is the official authorizing body in Kenya. Also, full disclosure and seeking of consent from participants or respondents was done, and every one of them was briefed about the research in terms of the topic, purpose, and objectives of the study, data usage, and confidentiality before deciding to participate in the research voluntarily.

Where applicable, a field data collection consent form was filled out and signed by the respondent or participant and the researcher (author/research assistant) to formalise the consent. Finally, the Ministry of Health guidelines on the novel COVID-19 virus containment

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measures, as the study fieldwork was conducted during the COVID-19 period. The containment measures applicable in Kenya then included wearing face masks and keeping safe social distance.

Data Analysis

Household (HH) Questionnaires Response Rate

A total of 336 out of 393 were successfully completed and returned by the respondents. This is an average questionnaire return rate of approximately 86 percent, above the recommended return rate of 80 percent (Okaka, 2016). The individual return rates varied for each of the purposively selected administrative locations, Kibage Location being the highest (100%) and Rwathia Location the lowest (78%). The overall and the individual response rates per location were above the prescribed threshold of 70 percent (Dillman, 2011), hence considered sufficient for a scientific study. Table 5 shows a breakdown of individual HH questionnaire completion and return rates per administrative location.

Table 5: Household (HH) Questionnaire Return Rates

Sub-county	Location	Proportionately Computed HHs	Actual HHs Sampled	Response Rate in Percentage (%)
Kangema	Kihoya	57	48	83.8%
Kangema	Rwathia	51	40	78.0%
Mathioya	Gitugi	50	42	83.3%
Mathioya	Kiru	37	33	88.6%
Kiharu/Kahuro	Murarandia	33	30	90.4%
Kigumo	Mariira	39	33	85.3%
Kigumo	Kinyona	48	38	83.2%
Kandara	Kibage	26	26	100%
Gatanga	Mbugiti	52	44	84.7%
Total		**393**	**336**	**85.5%**

Source: KNBS, Volume II, (2019

The researcher was interested in knowing the reasons for the respondents' non-response to the HH questionnaires; hence, reasons were sought from the participants who declined to respond. The reasons were varied and ranged from fear of political persecution (57%), where those who declined claimed that their information would be used for political reasons, lack of monetary gains from the exercise was cited by 26 percent, lack of confidence in any research findings out of previous experiences (5%), decline with no apparent reasons (12%), to other indefinite reasons by 2 percent.

Figure 1 shows why respondents declined to participate in the HH interview, as per the study location. Political reasons were dominant, and this was attributed to the fact that Kenya was nearing the general elections, and political activities had set in at the time of fieldwork.

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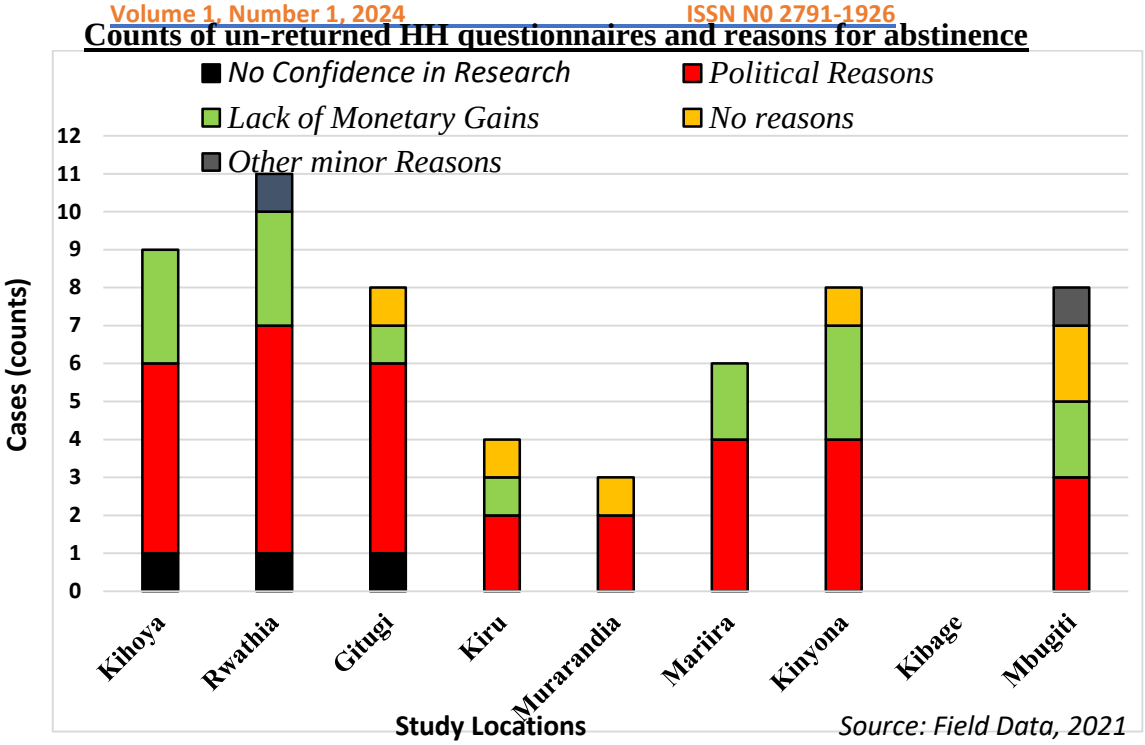

Fig. 1: Participation in the household questionnaire data collection

Social-demographic Characteristics of The Household (HH) Survey Respondents

The socio-demographic characteristics of the HH questionnaire respondents were varied, as shown in Table 6. A total of 207 respondents were males, comprising 61.6 percent, while 129 (38.4%) were females. Age-wise, respondents who were above 50 years constituted 47.9 percent. The upper age cohorts were considered relevant to the study because of their accumulated years of experience and knowledge. The youngest and oldest respondents were 20 and 102 years, respectively.

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Table 6: Demographic Characteristics Respondents

Demographic characteristics of the respondents	Frequency	Percentage (%)
Sex		
Male	207	61.6
Female	129	38.4
Intersex	00	0.0
Marital status		
Single	46	13.7
Married	274	81.5
Divorced	04	1.2
Separated	04	1.2
Deceased	08	2.4
Age cohorts in years		
18-20	1	0.3
21-35	49	14.6
36-50	125	37.2
Above 51	161	47.9
Highest education attainment		
No formal education	40	11.9
Primary school	139	41.4
Secondary school	130	38.7
College certificate	08	2.4
College diploma	17	5.1
Undergraduate degree	02	0.6

Source: Field data, 2021

Results Presentation and Discussions

The discussions include the local peoples' interactions and experiences with landslides and the negative and positive impacts of landslides in Murang'a County.

Local People's Interactions and Experience with Landslides

Table 7 outlines the local people's interaction and experiences with landslides over time. An overwhelming count of 97 percent of local people considered landslides as disasters in Murang'a County, and 88.7 percent said that there had been an increase in cases over time. Importantly, 80.8 percent of those who reported having experienced a landslide (94.3%) said that the cases were within close proximity of less than one kilometre from their homes. In comparison, 3.9 percent of the respondents reported that the reported landslides directly affected them. Some of the respondents had multiple landslide cases, as one FGD participant lamented by saying that:

> *Guku nikwendetwo muno ni matuika! O hindi kungiura mbura nene no nginya gutuike. Riu ni rita ria kau…kana! No tutire kundu gwa guthamira"*- A male FGD participant in Rwathia, Kangema Sub-county.

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'*This area is 'loved so much by' ('prone to') landslides! Every time it rains heavily, landslides must occur. It is now the fourth time! However, we have nowhere to relocate to'.*

Table 7: Resident Experience with Landslide Disasters

Landslide Aspect	Number (Counts)	Percentage (%)
Understanding of landslides as a disaster		
No	08	2.4
Yes	326	97.0
Not sure	02	0.6
Frequency of landslides		
Increasing	298	88.7
Constant	24	7.1
Decreasing	14	4.2
Ever experienced a landslide		
No	16	4.8
Yes	317	94.3
No response	03	0.9
Directly affected by a landslide		
No	143	42.6
Yes	180	53.6
Experienced destructive landslides destructive	13	3.9
No		
Yes	10	3.0
Not applicable	310	92.3
Number of times affected by a landslide in lifetime	16	4.8
1 (once)		
2 (Twice)	69	33.7
3 (Thrice)	69	33.7
4 (Four times)	51	24.9
5 (Five times)	06	2.9
Distance from one's home in km for those who ever experienced landslides	10	4.9
0.0- 1.0 km (Affected)		
1.1-3.0 km	252	80.8
3.1-6.0 km	52	16.7
	08	2.6

Source: Field Data, 2021

Positive Impacts of Landslides in Murang'a County

On a positive note, residents in areas affected by or prone to landslide hazards and disasters reported to have received support in various ways. The supports were mostly in monetary forms and re-building of better infrastructures and houses in safer grounds. Such were received from the government and other well-wishers, such as the Kenya Red Cross Society and local politicians. Interestingly, even though such deeds were termed as being positive by the locals, in some cases, they added to the negative impacts in one way or another. For instance, due to social evils such as favouritism, some undeserving locals, some of whom had not been affected

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by landslides in any way, were unfairly given priority in receiving support from the authorities at the expense of the deserving persons. Misappropriation and misuse of funds and other resources meant for the affected people were reported on the same latitude. All these added to the negative impacts of landslides, a departure from the intended benefits to the local affected community.

A notable and direct benefit of landslide occurrences was the financial benefits to the so-called 'absentee landlords and landladies' in areas affected by the landslides. 'Absentee landlords and landladies' are the indigenous people who own houses in their respective localities but do not reside in the said houses for the better part of the year. Such people are said to work and reside in other areas, especially in major towns and cities. They would only occasionally reside in their houses on a few selected days within a year. Such house owners benefit from rental income once their houses are leased out by the relevant authority, albeit on a temporary basis, to settle the displaced persons. In such cases, the authorities, mostly drawn from the local and national governments, would identify the owner's house, and through mutual agreements, the houses would be rented to temporarily relocate the affected locals when needed. The owners of the houses would then be compensated for the periodic lease. Such instances were reported at the Rwathia location in Kangema Sub-county.

Conclusions and Recommendations

The impacts of landslides on residents living in prone areas indicated more pronounced negative effects compared to the positive ones. The most outstanding negative impact is psychological stress. Key adverse effects also include loss of properties, displacements, deaths, and loss of animals and crops. Secondary and indirect negative impacts are boundary disputes, shared resource conflicts, and disruption of services. Positive impacts include reconstructing better, safer infrastructures such as bridges, roads, and buildings.

An interesting positive benefit reported was on the local people who have houses but never use them for habitation all the time in a year. Such are called the 'absentee landlords or landladies' who benefitted from rental income to lease their houses to resettle people displaced by the landslides momentarily. The study concludes that efforts by different stakeholders should be put in place to address the impacts of landslides. Both county and national governments should have an all-inclusive disaster management programme involving the residents who are directly impacted. Including diverse stakeholders in disaster management is a strength and aligns with the global approach to reducing and managing unavoidable hazards and disasters (Shaw et al., 2009).

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