

Examining the key dimensions of socioeconomic vulnerability among households in Kakamega County, Kenya

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ABSTRACT

Disaster risk remains a major global challenge affecting both developed and developing countries, with increasing frequency and intensity largely attributed to climate change and environmental degradation. Despite the coexistence of high socioeconomic vulnerability and escalating disaster risks in Kakamega County, Kenya, limited empirical evidence exists on how specific dimensions of socioeconomic vulnerability influence household-level disaster risk. This study examined the key dimensions of socioeconomic vulnerabilities among households in Kakamega County, Kenya. Conventional and Access model theories were used in this study. The study adopted descriptive and evaluative research designs, targeting 433,207 households across four purposively selected sub-counties (Lurambi, Mumias West, Lugari, and Ikolomani). A sample of 399 household heads was determined using Yamane's formula and selected through stratified random sampling, while 38 key informants were purposively selected. Primary data was collected using questionnaires, interview guides, and focus group discussions; secondary data was obtained from government reports, policy documents, and peer-reviewed journals. Validity was established through Content Validity Index (CVI > 0.7), and reliability was confirmed using Cronbach's Alpha (> 0.7). Quantitative data was analyzed using descriptive statistics and Spearman's Rank Correlation, while qualitative data was analyzed thematically using NVivo software. The study found that socioeconomic vulnerability was driven primarily by inaccessibility to information (36%), low income (26.3%), limited financial services (22.06%), and illiteracy (17.79%). Income poverty was high, with 66% of respondents living below one dollar per day, while 78.70% reported receiving no government support. A significant positive correlation was established between household size and disaster impacts, including food insecurity ($r_s = 0.684$, $p < 0.05$), loss of income ($r_s = 0.641$, $p < 0.05$), and human insecurity ($r_s = 0.598$, $p < 0.05$), indicating that larger households experienced more severe disaster impacts. The study concludes that households in Kakamega County remain highly vulnerable due to persistent poverty, limited asset ownership and weak access to government support and inadequate disaster preparedness, with household size significantly influencing disaster impact severity. The study recommends strengthening inclusive social protection systems by removing administrative barriers such as lack of national identification documents to ensure vulnerable households access government support. The study recommends policy makers to support livelihood diversification and household-level preparedness by promoting alternative income sources, expanding access to financial services and supporting household emergency planning.

Keywords: Disaster Risk, Households, Kakamega County, Kenya, Socioeconomic Vulnerability

I. INTRODUCTION

Disaster risk remains a major global challenge affecting both developed and developing countries, with increasing frequency and intensity largely attributed to climate change and environmental degradation. The Sendai Framework for Disaster Risk Reduction emphasizes the urgency of anticipating, planning for, and reducing disaster risks to safeguard lives, livelihoods, and socioeconomic systems. Vulnerability to disasters varies significantly across populations and is influenced by factors such as age, health status, income levels, and housing conditions. Globally, the disaster risk landscape is undergoing a profound transformation driven by the convergence of climate change, rapid urbanization and economic interdependencies. According to the United Nations Office for Disaster Risk Reduction [UNDRR] (2022), the number of disaster events is projected to reach 560 annually by 2030, representing a substantial increase over previous decades. This rise is associated not only with natural hazards but also with systemic risks, where shocks in one sector can trigger cascading effects across social, economic and environmental systems. While developed countries experience higher absolute economic losses, developing countries suffer disproportionately due to limited coping capacity, often resulting in long-term setbacks to development and persistent cycles of vulnerability.

In Africa, disaster risk is compounded by structural socioeconomic challenges. The continent exhibits some of the highest levels of economic vulnerability globally, as measured by the Economic Vulnerability Index developed by the United Nations Committee for Development Policy and the Foundation for International Development Studies and Research. Studies by Mulwa and Visser, (2020) indicate that African economies are particularly susceptible due to dependence on rain-fed agriculture, limited economic diversification and exposure to external shocks. Between 2000 and 2021, Sub-Saharan Africa experienced multiple crises, including pandemics such as Ebola and COVID-19, climate-related hazards and economic disruptions, all of which have intensified household-level vulnerability. These challenges are further exacerbated by governance constraints and infrastructure deficits, limiting the effectiveness of disaster preparedness and response mechanisms.

Kenya has experienced steady economic growth over the past decade. However, significant inequalities, unemployment and governance challenges persist. Despite attaining lower-middle-income status, many households remain vulnerable to shocks, particularly in rural and peri-urban areas where access to essential services and economic opportunities is limited. External shocks, including the COVID-19 pandemic, have further exposed structural weaknesses in socioeconomic systems and disaster preparedness. Kakamega County is characterized by rapid population growth, shifting demographic structures and persistent socioeconomic challenges.

According to the Kakamega County Integrated Development Plan (2022–2027), the county faces a high dependency ratio, low life expectancy and increasing pressure on resources and public services. The region is also prone to multiple hazards, including flooding, mudslides, fires and mining-related accidents (County Government of Kakamega, 2022; Otenyo, 2022). These hazards disproportionately affect low-income households, exacerbating existing inequalities and undermining livelihoods. Socioeconomic vulnerability indicators such as housing quality, access to healthcare, access to information, employment status, population density and patterns of rural–urban migration play a critical role in shaping household exposure, sensitivity and capacity to cope with disasters. Understanding how these factors interact to influence disaster risk at the household level is essential for designing effective and context-specific disaster risk reduction strategies.

1.1 Statement of the Problem

Households in disaster-prone regions continually adopt diverse livelihood strategies such as subsistence farming, manual labor and small-scale enterprises to mitigate the impacts of recurrent hazards (Ahmed, 2025). In many cases, they also rely on informal social networks to access information and resources for risk reduction. However, the effectiveness of these coping mechanisms remains limited due to persistent structural constraints, including marginalization, weak governance systems, rural–urban migration pressures and inadequate access to essential services such as clean water and healthcare. According to the Kenya National Bureau of Statistics (2020), Kakamega County is reported to have a multidimensional poverty rate of 70.8%, reflecting widespread deprivation across key socioeconomic indicators. This is further exacerbated by rapid population growth, high levels of youth unemployment and entrenched gender inequalities, all of which intensify household vulnerability. At the same time, evidence from the County Government of Kakamega (2023) indicates a marked increase in both the frequency and severity of localized disasters including flooding, prolonged dry spells, mudslides and invasive species outbreaks over the past decade.

Despite the coexistence of high socioeconomic vulnerability and escalating disaster risks, there is limited empirical evidence on how specific dimensions of socioeconomic vulnerability influence household-level disaster risk in Kakamega County. Existing studies have largely examined these issues in isolation, with insufficient attention to their interaction and the extent to which vulnerability shapes exposure, sensitivity and coping capacity at the household level. This gap constrains the development of targeted and context-specific disaster risk reduction (DRR) interventions. Addressing this gap is critical for informing policy and practice, particularly in the context of frameworks such as the Sendai Framework for Disaster Risk Reduction and the Kakamega County Disaster Management Act, which emphasize the need for integrating vulnerability analysis into disaster risk management. Therefore, a systematic examination of the key dimensions of socioeconomic vulnerability on households was necessary to enhance local coping capacities and support evidence-based DRR programming in Kakamega County.

1.2 Research Objective

The objective of the study was to examine the key dimensions of socioeconomic vulnerability among households in Kakamega County, Kenya

II. LITERATURE REVIEW

2.1 Theoretical Review

This study is anchored on two theoretical frameworks; Conventional Risk Theory and Access Model Theory. According to conventional risk theory, risk exposure consists of an exogenous and endogenous component as people

are - to some extent - able to protect them self against (the negative impacts of) environmental risks, by avoiding the risk involved or by taking protective (preventive) measures before Socio-economic vulnerability and adaptation to environmental risk being exposed to the risk or afterwards (e.g. insurance). There is deliberation on the exposures brought about by socioeconomic vulnerabilities and address the gap that exists so as to find a sustainable solution.

Following the seminal work by Massop (2023), there is furthermore distinguishing explicitly between the likelihood of being struck by household disaster (probability of exposure) and the severity of the disaster (measured through damage cost) in this theory, there is refrain from attaching probabilities to flooding (flooding being an annual event) and simply measure (i) the socioeconomic vulnerability to risk exposure through the dependence on natural resources (forests, gold mines, water) (ii) the level of vulnerability state through assessment of poverty levels depth at individual household level, and (iii) the consequence of risk exposure through economic damage cost, loss of livelihood, loss of lives when the disasters occurs at individual household level. (iv) The disaster risk reduction strategies as a determinant of resilience to the risks. Conventional socioeconomic vulnerabilities used in this study include annual household income compared to the Kenya National Bureau of Statistics and KIPPRA and household access to and ownership of natural resources, health services, education and opportunities to identify the socioeconomic vulnerability index so as to effectively and sustainably reduce household disaster risks.

Access model theory explores how people and groups can benefit from resources, focusing on the ability to gain access (resources, people, institutions) rather than just ownership rights, encompassing concepts like proximity to valued things like jobs and amenities, affordability, availability, and social power dynamics to explain inequalities in resource distribution, environmental issues, and healthcare access. In this research access model points out that vulnerability isn't just about location, but about unequal access to vital resources (income, assets, services) shaped by social/economic/political systems, thus exposing households to disasters. Households' inability to access resources (money, food, information, support) needed to live and recover before and after a disaster, social structures that creates vulnerability by determining who gets resources and who doesn't together with the economic and political systems that allocate assets, income, and resources unequally, puts some households to be inherently more vulnerable than others.

Low-income households, often dependent on primary sectors like agriculture, suffer more because they lack resources to buffer disaster impacts, they lack the means (e.g., insurance, strong housing, savings) to cope. This is tied to poverty, housing quality, and social exclusion which increases deprivation costs" (lost access to essentials). This then shows the relationship between socioeconomic vulnerability status and disasters which guides the objective 3 of this research on the evaluation of disaster risk reduction strategies because access theory advocates that Effective strategies must address root causes by improving resource access and social protection, not just reducing physical asset losses.

2.2 Empirical Review

2.2.1 Global Socioeconomic Vulnerability

Globally, socioeconomic vulnerability is widely understood as the set of social and economic conditions that influence the degree to which individuals and households are susceptible to harm from hazards (Wisner, 2020). These conditions include income levels, education attainment, employment status, housing quality and access to basic services such as water and healthcare. The Sendai Framework for Disaster Risk Reduction (2015–2030) emphasizes that disaster impacts are not determined solely by hazards but by underlying vulnerabilities that shape exposure and adaptive capacity (UNDRR, 2022; Wisner, 2020). Wang *et al.* (2025) similarly demonstrate that integrating hazard, exposure, and vulnerability dimensions provides a more robust understanding of spatial risk disparities. Despite this recognition, critics argue that measurement of DRR progress remains hazard-centric, failing to fully capture the development data that reveals root causes of vulnerability (Chmutina *et al.*, 2021; Wisner, 2020).

Empirical evidence demonstrates that socioeconomic vulnerability operates through multiple pathways: low-income households face heightened exposure due to residence in hazard-prone areas, reduced sensitivity is limited by inadequate access to information and resources, and coping capacity is constrained by financial and social limitations (Blaikie *et al.*, 2014; Oliver-Smith, 2022). Furthermore, research indicates that structural inequalities such as income disparities, disability status, and inadequate housing conditions create cumulative disadvantage that amplifies disaster impacts (Kuran *et al.*, 2020). For instance, households lacking access to clean water, secure housing and diversified income sources are more likely to experience severe impacts from disasters (Dlamini *et al.*, 2025).

According to a study conducted in Sri Lanka on flood and drought impacts, 55% of households were exposed to flooding events with poor households suffering disproportionately higher relative losses compared to non-poor households, according to Sri Lanka Ministry of Disaster Management in 2024. The study further revealed that while non-poor households could recover within approximately three months, poor households required up to ten months to recover fully. This demonstrates that vulnerability is not only about exposure but also recovery capacity, which is strongly influenced by socioeconomic status. This multidimensional understanding of vulnerability has important implications for disaster risk reduction, emphasizing the need for interventions that address not only hazard exposure but also the social and economic determinants of household resilience (Mercer *et al.*, 2016; Wisner, 2020).

2.2.2 Socioeconomic Vulnerability in Africa

In Africa, socioeconomic vulnerability is intensified by high poverty levels, limited social protection systems and dependence on climate-sensitive livelihoods (World Bank, 2021). The continent exhibits some of the highest economic vulnerability indices globally, driven by heavy reliance on rain-fed agriculture, low economic diversification, and exposure to recurrent shocks such as droughts, floods, epidemics, and economic disruptions (African Development Bank, 2024). According to a World Bank report in 2020, the COVID-19 pandemic pushed an additional 70 million people globally into extreme poverty with Africa accounting for a significant proportion of this increase. As a result, food insecurity rose sharply with over 250 million people in Africa becoming undernourished.

Besides, research across sub-Saharan Africa demonstrates that land access is one of the strongest predictors of flood preparedness and disaster vulnerability (Livne *et al.*, 2025). Households lacking adequate land are often forced to remain in flood-prone areas even during disasters due to limited relocation options and reduced capacity for risk diversification (Livne *et al.*, 2025; Wang *et al.*, 2025). In a comprehensive review by Saber *et al.* (2025), countries like Mali and Senegal are battling desertification, requiring reforestation and sustainable land management practices. In the same way, agriculture in Nigeria, Kenya, and Mali is significantly impacted by droughts, demanding investment in resilient crops and improved irrigation systems (Saber *et al.*, 2025). In South Africa, housing shortages compel individuals to construct dwellings in floodplains and environmentally sensitive areas, rendering them disproportionately exposed to climate-induced disasters such as flooding (Dlamini *et al.*, 2025). The devastating April 2022 floods in KwaZulu-Natal, which caused over 450 deaths and displaced more than 40,000 people, exemplify how socioeconomic factors such as spatial inequality, informal settlement proliferation, and governance failures compound disaster vulnerability (Dlamini *et al.*, 2025; Auma *et al.*, 2025).

Socioeconomic vulnerability influences disaster risk through limited healthcare access, which forces households to incur out-of-pocket expenditures, reducing their ability to recover from disasters (World Bank, 2021; Auma *et al.*, 2025). Globally, 170 million people face both high flood risk and extreme poverty, of whom 44% reside in Sub-Saharan Africa (Rufat *et al.*, 2015). Income inequality has been identified as a stronger predictor of flood mortality than GDP alone, because marginalized groups often lack the resources required to prepare, evacuate, and recover (Sisay, 2024). It is revealed that households often rely on informal coping mechanisms such as borrowing or asset liquidation (World Bank, 2021). Approximately 14% of households in low-income countries sell productive assets during crises, weakening long-term recovery capacity (World Bank, 2021). Further, it is noted that weak social protection systems increase exposure to shocks. Although some countries have introduced cash transfer programs, coverage remains limited and inconsistent across regions (African Development Bank, 2024).

Women are disproportionately affected by disaster risks due to inequalities in employment, income, and access to productive resources (Abebe, 2014; African Gender Index, 2019). The African Gender Index (2019) shows that women's economic empowerment is significantly lower than men's, increasing their vulnerability during crises. Gender-sensitive responses and inclusive policy approaches are therefore essential for building effective disaster resilience (UNDRR, 2022; Mercer *et al.*, 2016). Despite these challenges, the integration of indigenous knowledge with scientific approaches, participatory governance, ecosystem-based adaptation, and green infrastructure have shown promise in simultaneously reducing physical risks and addressing entrenched socioeconomic inequalities (Iloka, 2016; Mercer *et al.*, 2016). This continental context provides essential background for understanding vulnerability dynamics in Kenya and specifically Kakamega County, where similar structural factors (agricultural dependence, service access gaps, and gender disparities) interact with local hazards.

2.2.3 Socioeconomic Vulnerability in Kenya

In Kenya, socioeconomic vulnerability significantly influences how households experience disasters such as droughts, floods and food insecurity (Owuor, 2015; Rotich, 2019). Although the country has recorded steady economic growth averaging approximately 5.6% between 2014 and 2019, inequalities in income, employment and access to services continue to expose households to high disaster risk (Kenya Institute for Public Policy Research and Analysis [KIPPR], 2020). The 2015/2016 KIHBS report revealed that 42.9% of households experienced income loss due to disasters, 13% experienced asset loss and 38.8% experienced both income and asset losses (KNBS, 2018). This demonstrates that socioeconomic vulnerability directly determines the severity of disaster impacts at the household level (UNDRR, 2022). Household disaster impacts in Kenya are strongly linked to dependence on rain-fed agriculture, which employs over half of the population and accounts for approximately 34% of Gross Domestic Product [GDP] (Government of Kenya [GoK], 2020).

In ASALs and other areas, households are heavily reliant on farming and livestock, making them particularly susceptible to environmental hazards (Wambua, 2019). The 2019 drought alone affected over 2.6 million people and caused significant livestock losses, demonstrating the scale of vulnerability (GoK, 2020). Report by KNBS (2018) indicates that the key vulnerability pathways in Kenya include income vulnerability where high income inequality reduces household ability to absorb shocks. Poor households lack savings and are more likely to fall deeper into poverty

after disasters (KIPPRA, 2020). Income inequality remains high in Kenya, with a Gini coefficient of approximately 0.386, indicating uneven income distribution (KNBS, 2020). Low-income households are particularly vulnerable due to limited savings and weak financial buffers, making recovery from disasters more prolonged and difficult (KNBS, 2020; World Bank, 2021).

According to KIPPRA (2020), youth unemployment has remained a major concern, with unemployment rates highest among individuals aged 20–24 years (19.2%). This exacerbates employment vulnerability since high youth unemployment and informal employment limit income stability, increasing sensitivity to shocks (KIPPRA, 2020). On the other hand, Kenya's agricultural sector is highly sensitive to droughts and floods, creating recurring food insecurity cycles resulting into food security vulnerability. Wambua (2019) reports that this food insecurity is driven by climate variability, land fragmentation, low agricultural productivity, and population pressure. The Kenya National Bureau of Statistics (2020), further, reports that low-income households are less likely to access quality healthcare, increasing exposure to catastrophic health expenditures during disaster events (KNBS, 2020). As a result, healthcare vulnerability is aggravated since only 17% of the population covered by health insurance (KNBS, 2020). Despite women contributing up to 80% of agricultural labour, they own only about 1% of land and receive only 10% of agricultural credit (KNBS, 2018). This inequality reinforces gendered vulnerability, as women-headed households face greater exposure and lower coping capacity during disaster events (African Gender Index, 2019). These factors collectively demonstrate that socioeconomic vulnerability significantly increases household disaster risk in Kenya (Owuor, 2015; Rotich, 2019). Addressing these vulnerabilities requires integrated policies that address structural inequalities in employment, income, education, and gender, alongside enhanced investment in social protection systems.

2.2.4 Socioeconomic Vulnerability in Kakamega County

At the local level, Kakamega County presents a clear case where socioeconomic vulnerability directly influences household disaster risks (CGK, 2023; Otenyo, 2022). The county is characterized by high population density (587 persons/km²), low access to safe water (29.5%), heavy reliance on biomass energy (88% firewood use), high levels of informal employment and limited land ownership security (61.4% without title deeds) (KNBS, 2018). These conditions significantly increase household exposure and sensitivity to disasters (Rufat *et al.*, 2015). With a total population of 1,867,579 people and 433,207 households, the county faces increasing pressure on resources and public services (KNBS, 2018; County Government of Kakamega, 2022). The dependency ratio remains high, with low life expectancy and rapid population growth exacerbating existing vulnerabilities (County Government of Kakamega, 2022). The main sources of livelihood in Kakamega County's urban areas indicate that trade is the dominant source of income in Kakamega Municipality (59%), followed by employment (30%), while in Mumias Municipality, employment is the primary source (42%), followed by trade (38%) and agriculture (13%).

Kakamega County experiences multiple hazards including floods, droughts, landslides, lightning strikes, fires, and mining-related accidents which disrupt livelihoods and destroy infrastructure (County Government of Kakamega, 2023; Otenyo, 2022). The Kakamega County Participatory Climate Risk Assessment in 2023 reports that excessive rainfall and floods cause loss of lives and livestock, increased disease cases, displacement of communities, and loss of income from reduced productivity. Agricultural households are particularly affected due to dependence on rain-fed farming, with floods along River Nzoia, River Lusumu, and River Yala causing significant crop and livestock losses.

III. METHODOLOGY

3.1 Study area

This study was conducted in Kakamega County, Kenya. The region lies between latitudes 00° 54' North and 00° 03' South and longitude 34° 21' and 35° 14' East (GoK, 2020). The coordinates were used to spatially delimit the study area and ensure that the geographical coverage of the study corresponded to the administrative boundaries of Kakamega County. The study purposively selected Kakamega County based on methodological and contextual considerations relevant to examining the key dimensions of socioeconomic vulnerability. This study responds to this gap by adopting a socioeconomic vulnerability perspective that prioritizes household-level characteristics including income levels, employment status, access to services, housing conditions and social capital as key determinants of disaster risk. In Kakamega County, vulnerability is increasingly shaped not merely by geographic location but by the differential capacity of households to anticipate, cope with and recover from disaster events. Consequently, it has been presumed for a long time that Kakamega County isn't a disaster-prone area due to geographical location but then households within the same urban setting may experience different levels of risk depending on their socioeconomic status.

3.1.1 Population Distribution of the study area

The total population of the study area is 1,867,579 people with 897,133 male, 970,406 female and 40 intersex people (KNBS, 2019). The study area has a population density of 618km². The study population comprised household heads in Kakamega County, defined as male or female adults aged 18 years and above who were responsible for household decision-making. The study also targeted key informants, including officials from national and local government, non-governmental organizations, community leaders, and representatives of vulnerable groups (PWDs, women, and youth) at the ward, sub-county, and county levels.

3.1.2 Hazards and vulnerability profile of the study area

Kakamega County has over the years been characterized by various disasters such as floods, fires, mine collapse, Road Traffic Accidents and other hazards such as lightning strikes mudslides among others. The County Directorate of Disaster records show that floods are common in the southern region of the county, fires are common in both central and southern region, road traffic accidents in the Northern region while mine collapse is evident in central region of the county. Floods usually come with the heavy rainfall in the October-November season; which also is a factor on mine collapse and are frequent due to climate change.

Table 1

Disaster Profile of the study area

Subcounty	Hazard	Year(s) & Details
Lugari	Flash Floods	2019 and 2023 – River Nzoiai overflow; displaced households and submerged farms
	Road Traffic accidents	Frequency of 2 to 3 major incidences for the last 8 years. Oil spills from oil tankers have caused fires, loss of lives and fractures to road users. Tanker lost control, rammed two 14-seater matatus: 10 killed in 2021.
	Fire	For the last 10 years constantly
	Prolonged dry season	2004, 2007, 2012. Destroyed farm produce
Lurambi	Urban floods	2019,2023
	Mine collapse	2018,2019 and 2020,2022 more than 5 live are lost in each incident
	Fire	For the last 10 years constantly
	Diseases	Constant malaria outbreak
	Road Traffic accidents	Kisumu-Webuye Highway
Ikolomani	Mine collapse	2019,2021,2024,2025 .artisanal mines collapse frequently and have led to loss of more than 5 lives in eac incidence.
	Livestock Diseases	2020,203,2025 foot and mouth disease.Loss of kivistock ,causes human diseases from consumption of the Cacus
Mumias West	Floods	2018, 2020 along river nzoia causing displacement in Shibale village,destruction of farms and wildlife-human conflicts.
	Fires	For the last 10 years constantly

Source: County Emergency Operation Plan (2024)

3.1.3 Administrative Boundaries of the study area

At latitude 0054' N and 00 03' S of the equator, Kakamega is situated between longitudes 34021'E and 35014' E. Bungoma and Trans Nzoia Counties border the region to the north, Vihiga County borders it to the south, Siaya County borders it to the west, and Nandi and Uasin Gishu Counties border it to the east. Kakamega County, which has the largest rural population, is the fourth most populous county in Kenya after Nairobi, Kiambu, and Nakuru. It has a total area of 3,051.3 square kilometres, Twelve Sub-counties, sixty wards, one hundred and eighty-seven village units, and four hundred community areas. The Regional Coordinator, who oversees the four counties in the former Western Province and has headquarters in Kakamega town, is part of the national government's administrative structure in the county. The Kakamega County Commissioner, the Deputy County Commissioners overseeing the thirteen sub-counties, the Assistant County Commissioners managing the divisions, and the Chiefs overseeing the Locations, the Village Elders who oversee the villages, and the Assistant Chiefs, who oversee sub-locations.

The rich cultural heritage and fertile soils of Kakamega drew British immigrants in 1903, when they founded an administrative station. This is when the town's history began. The town's expansion was credited to the colonial gold rush of the early 1930s, which was sparked by geologist Albert Ernest Kitson's reports. Consequently, the colonialists founded the Roster man Mining Company. But when the Roster mine was closed in the late 1940s, the town's hopes for growth were dashed. Western Province was established in 1970, with Kakamega serving as its headquarters. The Kenya Tourist Development Corporation started building the Golf Hotel in 1979, and the Kakamega airstrip started to be built in 1981. The Luhya tribe, who live in Kakamega, are mostly engaged in the growing of cash and food crops. The ethnic

groupings of Batsotso, Wanga, Idakho, Isukha, Kabras, Kisa, Marama, Banyala, Bukusu, Maragoli, Banyole, and Tachoni are members of the Luhya tribe. Most other tribes in Kenya have also made their home in the County. The majority of the County's citizens identify as Christians or Muslims. During the past few decades, Kakamega County is one of the 47 counties in Kenya where dangers and disasters have been more frequent and intense.

3.1.4 Climatic conditions of the study area

The county experiences 1280.1 mm to 2214.1 mm of rainfall annually. The year-round rainfall pattern consists of strong downpours in March and July and light showers in December and February. The temperature ranges from 18 to 29 degrees Celsius. The months of January, February, and March are the warmest. Apart from July and August, which have somewhat cool spells, the following months have relatively similar temperatures. In the county, the average humidity is 67%. Since the early 1960s, there has been a warming trend in Kenya's lowest (night) and maximum (day) temperatures. The forecast for the future shows rising temperatures. Inter-annual variability and the distribution of precipitation are significantly rising in recent times. The number of days without rain in a row and the duration of shorter but heavier rainstorms have both increased, as has the frequency of floods. Future climate change may cause some extreme weather events to occur less frequently or with greater intensity, which could have negative consequences. Every major economic sector, including infrastructure, biodiversity, water availability, energy consumption, forestry, tourism, and agricultural production, will be impacted by rising average temperatures and variations in seasonal and yearly rainfall. Due to their susceptibility and lack of means to deal with the effects of climate change, the poor are more likely to be disproportionately affected.

3.1.5 Geology and Soils in the Study Area

The county's geology is composed of Kavirondian sediments, Nyanzian volcanic and intrusive rocks, primarily granites. Nonetheless, the majority of the region is covered in granite. In particular, the sequence of rocks and sediments that make up Kakamega County is part of the Precambrian basement system, which is a geological structure that developed during the Mesozoic era's Jurassic period. These processes took place during the middle and late Cretaceous, early Tertiary, and Pleistocene periods. The rocks of the basement system are mostly located east of the Nandi fault. They are composed of high-depth extrusions of acid to basic Nyanzian volcanic, such as basalts, andesitic tuffs, agglomerates, and rhyolites, which are covered in a thick layer of coarse Kavirondian conglomerates, grits, and finely banded mudstones stretching to the central parts.

Major intrusions of two granitic rock groups that constitute the Mumias and Maragoli Goldfields are also comprised of the Nyanzian and Kavirondian sediments. The only rock strata in the age group, the outcrop of fine- to extremely coarse-grained tertiary phonolites, is situated on a very uneven terrain toward the south. The county's geological formation is a result of weak faulting and corrective volcanic activity that took place during the Pleistocene rift valley's creation. Mostly in river valleys, the soils generate large deposits of black clays; they also form sandy soils, gravelly alluvium (which yields significant amounts of alluvial gold), lateritic ironstone capping, and black silt deposits beside streams. Large areas of forest reserves with deep soils can be found in the central and eastern regions, mostly near the base of the Nandi escarpment along the county, rock exposures are a regular occurrence, particularly along the streambeds, with the exception of the granite areas

3.1.6 Ecological conditions of the study area

The county is divided into two primary biological zones: the Lower Medium (LM) and the Upper Medium (UM). The upper medium includes the central and northern regions of the county, including Ikolomani, Lurambi, Malava, Navakholo, and Shinyalu, where large-scale farming is practised, as well as Lugari and Likuyani, where intensive production of maize, tea, beans, and horticulture is done mostly on a small scale. Butere, Khwisero, Mumias East, Mumias West, and Matungu are among the southernmost counties in the county that fall under the second ecological zone, known as the Lower Medium (LM). In this region, sugarcane cultivation is the main source of income, while some farmers also grow maize, sweet potatoes, ground nuts, tea, and cassava.

3.2 Research design

The study employed a mixed methods approach incorporating descriptive and evaluative research designs. The descriptive component was used to establish and characterize the existing dimensions of socioeconomic vulnerability in Kakamega County. Quantitative data were summarized using frequencies and percentages while qualitative data were used to provide contextual descriptions of socioeconomic vulnerabilities and household disaster risks. The evaluative component was used to assess the key dimensions of socioeconomic vulnerabilities against predefined household disaster risks. The study also adopted a concurrent triangulation mixed methods design. Quantitative and qualitative data were collected concurrently, analyzed separately and integrated during the interpretation stage to triangulate findings and provide a comprehensive assessment of the dimensions of socioeconomic vulnerabilities.

The study examined the key dimensions of socioeconomic vulnerabilities using a multidimensional evaluative framework comprising of dependence on livelihood, source of income, people living below a dollar a day, asset ownership, level of education, age, gender and access to health. Each dimension was assessed using specific indicators reflecting the household's ability to cope with the vulnerabilities. The assessment considered age of respondents with their understanding of disaster risks, access to health in relation affordability. Quantitative measures were used to determine the perceived level of education, asset ownership, income, dependence on one source of income of each household, while qualitative evidence provided contextual explanations of institutional strengths and constraints. This enabled the study to evaluate the household socioeconomic vulnerability to the existing household disasters.

3.3 Target Population

The study population comprised household heads in Kakamega County, defined as male or female adults aged 18 years and above who were responsible for household decision-making. The study also targeted key informants, including officials from national and local government, non-governmental organizations, community leaders, and representatives of vulnerable groups (PWDs, women, and youth) at the ward, sub-county, and county levels.

3.4 Sampling techniques and sample size

There are 12 sub-counties in Kakamega County. Out of the 12 sub-counties, 4 sub-counties were selected purposively to ensure representation of both urban and rural settings as well as areas experiencing different forms of disaster risks within Kakamega County. Their inclusion enabled the researcher to capture varied experiences related to disaster occurrence, preparedness, response and resilience, thereby enhancing the comprehensiveness and reliability of the study findings.

Sample size determination for the household heads was calculated using the Taro Yamane's formula for the population given by the following equation:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

n = sample size

N = target population

e = level of precision (0.05)

Thus:

$$n = \frac{433,207}{1 + 433,207(0.05^2)}$$

$$n = \frac{433,207}{1084.0175}$$

$$n \approx 399$$

Therefore, the researcher used stratified random sampling method to sample 399 household heads from the 4 sub counties as determined by (KNBS, 2019). The sample size was proportionately distributed as in Table 1 below.

Table 2

Proportionate Distribution of Sample Size by County

Category of Respondents	Target Population	Sampling Technique	Sample Size
Household heads	433,207	Yamane Formula	399
PWD leaders	30	30%	9
Women leaders	30	30%	9
Youth leaders	30	30%	9
Sub-County Police Commanders	12	30%	4
NGO team leaders on disaster risk	20	30%	6
Commissioner, St. John Ambulance	1	Census	1
Total	433,391		437

Source; Field data, 2024

3.5 Data Collection Methods

Primary quantitative data from the household heads was mainly collected using questionnaires, KII and FGDs while qualitative secondary data was collected from journals, reports and magazines. The questionnaire was structured with five number of items for the respondents to rank the statements based on key indicators on a scale of 1-5, whereby

= strongly agree, 2 = agree, 3 = don't know, 4= Disagree, 5= Strongly Disagree) based on the statements. The instruments were tested on 39 committee members based on the 10% of the sample size (399) in Sabatia Sub - County in Vihiga County. This helped the researcher to identify areas of concern in the instruments and also helped in reducing vagueness and improving understanding of the questions for precise responses. The researcher did 3 key informant interviews with the County Directors for DRR and 6 FGDs (2FGDs per county). The data collection was done between December 2025 and January 2026.

3.6 Data analysis

All the quantitative data from the questionnaires were analyzed using the Statistical Package for Social Scientists (SPSS) version 27.0 for both descriptive and inferential statistics and results are presented in the figures, charts and tables. Qualitative data were analyzed using thematic analysis. Interview transcripts and other qualitative responses were first transcribed, organized and reviewed repeatedly to facilitate familiarization with the data. Meaningful segments of text were assigned initial codes, which were subsequently grouped into categories based on similarities and relationships. The categories were then reviewed and developed into broader themes aligned with the study objectives.

3.7 Ethical Considerations

Permission to conduct the study was obtained from the Institutional Research Committee of Masinde Muliro University of Science and Technology (MMUST). A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). The researcher sought informed consent from the respondents before the beginning of data collection and assured the respondents that the information given was treated with confidentiality and was used for academic purposes only. Research Assistants were trained prior to the start of the fieldwork and the respondents had prior information on their right to withdraw at any stage of the engagement and the right to demand an explanation on the use of the information they intend to the researchers.

IV. FINDINGS & DISCUSSION

4.1 Findings

This section presents results, findings and discussions on the institutional capacity of subnational DRR platforms in the study area. The study respondents were the ward disaster management committee members whose age brackets were as follows: 25% (38) were 18-30 years; 46.9% (71) were 31-50years; 19% (29) were 51-60 years and lastly 9.1% (14) were over 60 years. On gender, 61.2% (92) of the respondents were male while 38.8% (59) were female. On the marital status of the respondents, 60.2% (91) were married, 20.8% (31) were widowed while 19% (29) were single. On level of education of the respondents, 19.3% (29) had attained primary education; 36.7% (55) had attained secondary education; 26.3% (40) had attained tertiary education with 17.7% (27) attaining university education. Finally, on occupation, 38.8% (59) were practicing farming, 26.3% 40) were doing businesses, 9.6% (14) were practicing fishing while 25.3% (38) were in other forms of livelihoods such as formal employment.

These findings were mainly on legal and policy structures, organizational structure and human resource capacity in the platforms, financial resources allocation, EWS and information sharing within the platforms, and multistakeholder networking of the subnational DRR platforms in the study area. The results are as presented in Table 3 followed by an interpretation and discussion of the findings in the sub sequent sections.

Table 3*Key dimensions of socioeconomic vulnerability to household disaster risks in Kakamega, Kenya*

Key aspects of socioeconomic vulnerability						
Social Vulnerability	Age 18-30	31-40	40-50	Above 50		
Age	27.8 % (111)	36.9% (158)	22.8% (91)	9.8%(39)		
Gender	Female -54% (215)	Male -46%(184)				
Level of Education	Tertiary -40.85% (163)	Secondary 34.84% (139)	University 13.7% (55)	Primary 10.53% (42)		
Access to healthcare	Access (56%) (223)	Availability 28% (112)	Affordability (16%)(64)			
Economic Vulnerability						
Source of Income	Peasant Farmers 38% (152) and large scale (4%) (16)	Manual Laborers (19%) (76)	Business (18%) (72)	Artisan miners (11%) (44)	Permanent employment (7%) (28)	Sand harvesting (3%) (12)
Live hood dependence	High (49%) (196)	Average (35%) (140)	Low (16%) (64)			
Asset Owned	None 46%(184)	Land 32%(128)	Houses 18 % (72)	Cars 4% (16)		

Source: Field data, 2024

4.1.1 Social Vulnerability

4.1.1.1 Age

Results in Table 1 indicate that averagely 36.9% are respondents of middle age between 31 to 40 years and the least age group was respondents of above 50 years old at 9.8%. According to the study this indicator is important in that, the age of an individual can significantly influence their ability to prepare for, respond to, and recover from a disaster. Different age groups have unique physiological, psychological, and social needs that must be considered in disaster risk reduction. For example, children and older adults are often more vulnerable to the effects of disasters due to their dependence on others for care and their potentially compromised physical and cognitive abilities. This indicates that in Kakamega county decision making in regards Disaster Risk Reduction is dwelling on younger population which was attributed to their availability and cognitive abilities although other studies indicated that older adults could be more prepared with fewer barriers. For example, they are more likely to have a communication plan, supplies of food and water, and other emergency supplies such as battery-powered radios, first aid kits, flashlights, and extra batteries than the younger generation.

Age in disaster risks reduction is essential to ensure that the needs of all individuals are met, regardless of their age. This includes considering specific requirements of different age groups in the planning and provision of needs during and after disaster. These findings are consistent with previous studies. For instance, individuals in the economically active age groups (particularly 30–40 years) are more likely to be involved in research due to their active roles in society and decision-making processes. Similarly, survey-based studies often capture a higher proportion of respondents from younger and middle-aged groups because they are more reachable and responsive compared to older populations. Overall, the age distribution in this study reflects a balanced but youth-leaning sample, with a strong representation of respondents in their most productive and engaged years, which can enhance the reliability and relevance of the data collected.

4.1.1.2 Gender

Results indicate that 54% (215) of the respondents were female while 46% (184) of the respondents were male. Results from this study indicated that more female availed themselves for the research which is attributed to the fact that more women and girls are affected by disasters and impacts are greater in women than men. According to the World Bank report “Gender Dimensions of Disaster Risk and Resilience: Existing Evidence”. Disaster Risk Reduction barriers, are shaped by social, economic, and cultural inequalities that include: Limited access to early warning systems and risk communication due to lower literacy rates, lack of mobile phone ownership, and exclusion from decision-making platforms difficulty in accessing safe shelter, particularly for women with caregiving responsibilities or mobility constraints, cultural norms prevent women from evacuating without male permission, Financial exclusion, without bank

accounts, credit, or insurance, limits women's ability to protect savings and recover economically after disasters, Disproportionate burden of unpaid care work, which increases during crises and limits women's time and mobility to engage in preparedness or recovery activities, Underrepresentation in decision-making and technical fields, such as meteorology, engineering, and emergency planning, results in disaster risk reduction strategies that often overlook women's needs and capacities.

Kakamega County because of the higher representation of women attributed to their active involvement in household management, community welfare activities, and disaster response initiatives within the selected sub-counties. Women are also more likely to be present at home during data collection exercises, increasing their chances of participation in household-based surveys. The relatively balanced gender distribution further suggests that the study captured views from both male and female respondents, thereby enhancing inclusivity and reducing gender bias in the findings. The participation of both genders was important because disaster risks and management strategies affect men and women differently within communities.

4.1.1.3 Education

The study sought to explore the level of education attainment among the respondents who represented the County of Kakamega County. Table 4 indicate that 10.53 % (42) had attained primary school level, 34.84% (139) had attained secondary school level while 40.85% (163) which is the highest had attained tertiary and the university level at 13.78% (55). This was followed by those with secondary education (36%), suggesting that most respondents had at least basic formal education beyond primary level. A smaller proportion had attained university education (15%), while the least represented group had only primary education (12%). Education plays a pivotal role in disaster risk reduction, which is why poor and marginalized communities become more vulnerable because of not having access to Disaster Risk Reduction education. This affects the perceptions, skills and abilities of individuals and communities, and the provision of a social system to minimize the risks and impacts of a disaster.

These findings imply that the majority of respondents (over 90%) had at least secondary education, which is important for the study because literacy levels are likely to influence understanding of disaster risk reduction strategies, interpretation of early warning information, and participation in preparedness programs (Iloka, 2016). The relatively high level of education among respondents may also be attributed to increased access to educational facilities within Kakamega County, particularly in urban and semi-urban sub-counties such as Lurambi Sub-County and Mumias West Sub-County. However, the presence of respondents with only primary education suggests that disparities in educational attainment still exist, particularly in rural areas such as Lugari Sub-County and Ikolomani Sub-County.

4.1.1.4 Access to Healthcare

This study assessed accessibility to healthcare services through accessibility, availability and affordability. Findings indicate that healthcare is accessible to 56% of the respondents; available to 28% of the respondents and affordable to only 16% of the respondents in the study area. Health means continual, proactive approaches for individual and collective physical and psycho-social health needs as an ongoing process, including when people are living with long-term health conditions, not just seeking professional medical attention when injured or ill but caring for and promoting one's health. According to this study, the researcher indicated that residence of the selected sub counties cannot afford healthcare which is contrary to what many think that availability of structures is equivalent to health. This was reported during an FGD as follows:

"We have health facilities around, but sometimes they are too far to walk and transport is expensive, and even when you reach there, you may wait for many hours and still be asked to buy medicine outside" (FGD-P15, 20th October 2025).

Wambua (2019) emphasizes that availability alone does not ensure access unless services are also affordable and physically reachable. The results suggest that although healthcare facilities are present, significant economic and logistical challenges prevent many respondents from fully accessing and benefiting from these services. This underscores the need for interventions aimed at reducing healthcare costs, improving service delivery, and enhancing physical access to ensure equitable healthcare utilization

4.1.2 Economic Vulnerability

4.1.2.1 Source of Income

Findings indicate that 38% of the respondents were peasant farmers, followed by manual laborers at 19% businesses at 18%; artisanal mining at 11%; permanent employment at 7%; Largescale farming at 4% and finally sand harvesting at 3%. Previous studies found that vulnerability to disasters is greatest for non-poor households which has been attributed to the fact they have more assets, incomes etc. but the difference with the poor is on the impacts. (De Silva & Kawasaki, 2018). Poor households often depend on agriculture and manual jobs to make a living, and therefore are more vulnerable to the effects of a disaster: vulnerability in this sense is a measure of a household's capacity to

anticipate, cope with, resist, and recover from the impact of a hazardous event. However, the relationship between poverty and financial damage due to disasters (and hence vulnerability) appears to be more complex. Average economic losses in absolute terms are significantly higher for wealthy households. Logically, their coping capacity is also greater, which is reflected by the fact that disaster loss relative to annual average income is significantly lower for these households (De Silva & Kawasaki, 2018).

4.1.2.1 Dependence on Livelihood

Results in Table 4 indicate that 49% of the respondents highly depend on their livelihoods for survival; 35% averagely depend on their livelihood while 16% lowly depend on their livelihoods. This distribution suggests that a significant proportion of the population relies heavily on their primary livelihood activities for survival and well-being. High dependence often implies limited alternative income sources, making individuals more vulnerable to economic shocks, environmental changes, or disruptions affecting their main source of income (Dlamini, *et al* 2025). The 35% (140) of respondents with average dependence reflect a moderately diversified livelihood base. These individuals may have supplementary income sources or coping strategies that reduce their vulnerability compared to those with high dependence. On the other hand, the relatively small proportion at 16% (64) with low livelihood dependence suggests that few respondents have achieved substantial diversification or financial stability, which would allow them to rely less on a single livelihood source.

This finding aligns with existing literature on livelihood strategies in developing contexts. According to Auma *et al.* (2025), rural households in developing countries often exhibit high dependence on a primary livelihood source due to limited access to assets, credit, and alternative employment opportunities. Similarly, Sisay (2024) emphasize that livelihood diversification is a key pathway to reducing vulnerability, yet many households remain highly dependent on a single source due to structural and economic constraints.

4.1.2.3 Asset Ownership

The results in table 4 indicate that 46% of the respondents do not own any assets; 32% owned land; 18% owned houses while only 4% owned cars. This distribution indicates generally low levels of asset accumulation among the respondents, with a significant proportion lacking ownership of key productive or household assets. The high percentage of respondents without assets suggests economic vulnerability and limited wealth, as asset ownership is often a critical indicator of financial stability and long-term security (Mukoya, 2024).

According to Blaikie *et al.* (2014), asset ownership is widely used as a proxy for household wealth, with lower asset accumulation indicating higher poverty levels and reduced economic resilience. Similarly, Livne *et al.* (2025) argues that ownership of assets such as land and housing plays a crucial role in reducing vulnerability, while a lack of assets limits households' ability to cope with shocks and improve their livelihoods.

V. CONCLUSION & RECOMMENDATION

5.1 Conclusion

The study concludes that households in Kakamega County remain highly vulnerable to disaster risks due to persistent socioeconomic challenges, including widespread poverty (with 66% living below one dollar a day), limited asset ownership (46% owning no assets) and weak access to government support (78.70% reporting no assistance).

5.2 Recommendation

The study recommends that County government should strengthen inclusive social protection systems by removing administrative barriers such as national identification requirements to ensure that vulnerable households, particularly women, persons with disabilities, and the elderly, can access government support programs, given that 78.70% of respondents reported receiving no government assistance in Kakamega County, Kenya.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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