

No Roads, No Services: The Tragedy of Rural Isolation

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How to cite this paper: Bauma, P. A., Muhigwa, J.-B. B., & Mushagalusa, E. M. (2025). No Roads, No Services: The Tragedy of Rural Isolation. *Open Journal of Social Sciences*, 13, 695-726.
<https://doi.org/10.4236/jss.2025.1311043>

Received: October 5, 2025

Accepted: November 25, 2025

Published: November 28, 2025

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Abstract

The study was conducted in Kalehe District (South Kivu, DRC) and aimed to analyze the living conditions of rural households, their access to infrastructure, livelihoods, and factors influencing their well-being. It is based on a qualitative survey conducted among 36 groups (30 focus groups + 6 key informants). The results show considerable isolation and difficult access to services, illustrated by critical distances. Residents often travel 5 to 25 km to access a road, market, school, health center, or drinking water source. This results in isolation and poor access to healthcare, education, drinking water, and economic opportunities. The most disadvantaged areas are the Ndando, Musenyi, and Karali communities, especially isolated villages such as Chifumbi, Erunga, Murambi, and Mumbiri. Living conditions are difficult. The majority live in poorly equipped and vulnerable mud houses. Income is very low and irregular, often only coming in during the harvest season. The main activities are agriculture (mixed farming), livestock farming, and very little small-scale trade. Subsistence and agriculture rely on widespread mixed farming as a survival strategy, but this is not very monetized. Challenges include a lack of modern tools, a lack of markets, and limited product processing. Possible solutions include agricultural diversification, support for cooperatives, access to credit, and rural infrastructure. Factors hindering well-being include insecurity, isolation, rural exodus, customary conflicts, and a lack of markets. Premature deaths are linked to poverty, malnutrition, isolation, and limited access to healthcare. Social harmony and governance leave much to be desired. Tribalism and community mistrust, which undermine cohesion, are to be condemned. Local administration is considered ineffective. Development actors include NGOs, local communities, and development committees. As strategic recommendations, we emphasize opening up the region through the rehabilitation of roads and lake

routes; promoting sustainable agriculture by supporting cooperatives and diversification; developing social services through the construction of schools and health centers in isolated areas; and promoting governance through local capacity building and citizen participation. Social cohesion requires community dialogue and the fight against tribalism. Territorial equity is essential. Targeted investment is needed in the most disadvantaged areas. This work highlights a complex reality but also concrete levers for transforming isolation into an opportunity for development.

Keywords

Rural Isolation, Disparities, Insecurity, Well-Being

1. Introduction

Isolation, characterized by limited access to infrastructure, services, and markets, is a major challenge for the development of rural areas. This lack of physical and economic accessibility has profound consequences for the well-being of rural populations, affecting their health, education, economic opportunities, and overall quality of life. It is necessary to understand the extent to which geographical and economic isolation impacts the well-being of rural populations, and what adaptation strategies and public policies are needed to mitigate these negative impacts. Isolation manifests itself in many ways and its consequences are interdependent.

Geographical isolation involves remoteness from urban centers, lack of transportation infrastructure (roads, railways, waterways), and difficulty accessing essential services (drinking water, electricity, healthcare), which limit opportunities for economic and social development. Previous research highlights the difficulties of accessing healthcare in isolated rural areas (Butterworth et al., 2024), as well as the consequences for mental health and well-being (Arriola et al., 2023; Atherton et al., 2023; Iwasawa et al., 2025; Podubinski et al., 2023; Richardson et al., 2017, pp. 75-83).

Limited access to education is also a significant effect of isolation, with long-term consequences for employment prospects and personal development (Raza et al., 2024). Economic isolation results from geographic isolation and often translates into difficulties in accessing markets, low diversification of economic activities, and dependence on subsistence agriculture. This can lead to poverty, food insecurity, and vulnerability to economic and environmental shocks (Chidarikire & Saruchera, 2024; Eslami & Namdar, 2022; Gautier et al., 2016; Hassan & Mohamed, 2024; Kondratev, 2022; Wangu & Githuku, 2022). The lack of employment opportunities drives young people to migrate to urban areas, exacerbating rural depopulation (Liu, 2023, pp. 1404-1421; Si et al., 2022; Török, 2015).

Isolation has multidimensional consequences on well-being, affecting physical

and mental health, education levels, income, access to social services, and sense of community belonging. Research shows a link between isolation, poverty, and mental health issues, including depression and anxiety (Escolà-Gascón et al., 2020). Social isolation is also an important factor, affecting the psychological and social well-being of rural populations (Ohta et al., 2022; Wang et al., 2017).

Recent peer-reviewed studies published between 2023 and 2025 discussed aspects of rural isolation in Central Africa, or Africa more broadly with implications for Central Africa. Nwachuya et al. (2023) highlighted the persistent challenge of accessing quality healthcare in rural communities across Africa. They specifically identified the “lack of infrastructure, inadequate funding, and regulatory challenges” as significant barriers to implementing telepharmacy, which is intended to bridge the gap between pharmacists and patients in these areas. The difficulties in establishing and utilizing telepharmacy services directly reflect the impact of rural isolation on healthcare access, where geographical distance and limited resources create a divide from essential services. While the study covers Africa broadly, these challenges are highly pertinent to rural communities in Central Africa, where such infrastructural and funding deficits are common, contributing to their isolation from advanced healthcare solutions. M. W. Lema (2025) focused on community-driven approaches to water resource management in East and Central Africa. He reviewed models that empower rural water users through participatory ownership and inclusive decision-making to manage water resources according to local needs, acknowledging the challenges faced by these communities, which can include limited external support and the necessity for self-reliance due to geographical or infrastructural isolation. The study’s focus on empowering rural populations to manage essential resources like water speaks to the need to overcome potential disadvantages arising from their remote locations.

The study of isolation and its impacts on rural well-being requires an integrated approach that takes into account geographical, economic, and social dimensions. It is crucial to analyze the adaptation strategies implemented by rural populations, as well as public policies aimed at improving accessibility and promoting sustainable development in isolated areas. This study will explore these different aspects in order to contribute to a better understanding of this complex issue and identify possible solutions to improve the well-being of rural populations. We propose to conduct this study in Kalehe District, an area that is isolated in several respects, in South Kivu, in the east of the DRC.

The specific objectives of this research are as follows:

- To identify the impact of isolation on the socio-economic situation.
- To gather proposals from local communities.

2. Methodology

2.1. Socio-Economic Characteristics of the Study Area, Kalehe District

Kalehe District (Figure 1) is located in the mountainous zone, one of the three

ecological zones that make up the province of South Kivu, located to the northwest and northeast of the city of Bukavu. It enjoys a mountain climate with an altitude ranging from 1300 to 2000 m. It has two alternating seasons: one rainy (eight months) and one dry (four months). Its terrain consists mainly of a mountain range in eastern DR Congo. It covers an area of 510,250 km² and has an estimated population of 623,607 (second half of 2024). There are seven linguistic and cultural groups (Bahavu, Bashi, Batembo, Bahunde, Banyanga, Hutu, and Tutsi emigrated during the colonial era and the “social revolution” that took place in Rwanda in 1959. The agricultural sector is dominated by organized plantations, the number of which has remained the same since the departure of the colonists, except that there has been a shift to other food crops during periods of peace. This sector is still dominated by food crops, with arable land occupied by large landowners who farm it directly or indirectly, place in Rwanda in 1959). The Bahavu are the largest tribe of all the other tribes.

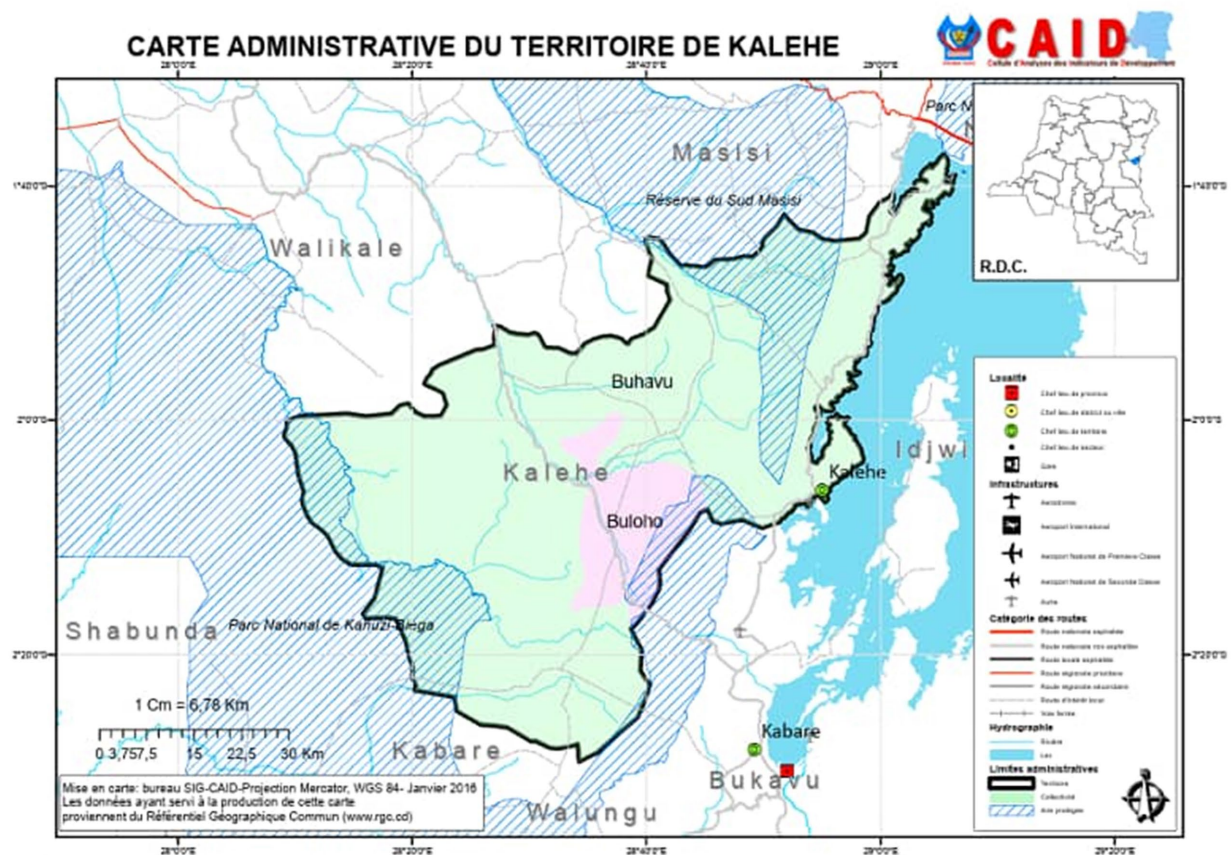


Figure 1. Administrative map of Kalehe District (CAID).

The most common farms are family farms, which account for about 56% of households. Kalehe District is an agricultural region that is very fertile and has high agricultural production. The livestock sector was characterized by large livestock, especially in the middle and high plateaus. The latter seemed attractive in rural areas, so that every family wanted to have some. Unfortunately, this livestock

farming has fallen victim to insecurity and has suffered considerable losses due to looting and the abandonment of farms. It continues to be ravaged by certain epidemics such as pseudo avian flu and others. Fishing, meanwhile, is characterized by artisanal production on the islets and coastal areas.

Marketing suffers from the highly perishable nature of the production.

Currently, trade, including the various supply chains for finished products, is experiencing significant disruptions due to the lack or scarcity of transportation. Wholesalers are rare, and retailers source their supplies from other retailers in order to buy in bulk. This has led to an increase in the prices of manufactured goods, which are indexed to the inflation rate.

Economically, the Kalehe District is made up of several major commercial centers (Kalehe-Ihusi, Nyabibwe, Nyamasasa, Kalungu, and Minova on the coastal axis, and Bitale, Fumya, Bulambika, Kambali, Kambegeti, and Hombo Sud on the northern border—Kivu on the Bunyakiri, Cifunzi,—Caminunu axis on the Kalongé axis) and Karasi-Kairenge-Chigoma-Ramba on the (Bulambika-Ziralo) axis. The main commercial establishments are only small permanent or semi-permanent shops, small makeshift hotels, and kiosks located in various centers of activity, which unfortunately have been subjected to systematic looting and destruction, as in the case of the Ramba commercial center (**Figure 2**).



Figure 2. A shopping center, Ramba.

Street vendors are the most active, taking advantage of the Bukavu-Minova-Goma, Bukavu-Bunyakiri-Hombo, and Bukavu-Miti-Kalonge roads, which are in a state of total disrepair, and access to lake traffic (motorized boats, pirogues, ships).

The high number of intermediaries between producers and consumers creates serious difficulties for farmers, who are forced to sell their agricultural and livestock products at low prices. This condemns farmers to sell some of their products, which are difficult to preserve or process, at prices that defy all competition.

Price control is also difficult to implement as a result of the economic liberalization policy adopted by our country. Crafts are the sector that suffers most from a lack of outlets. Most of the works produced by farmers (especially the Pygmy people) are not bought by the local population. The absence of a permanent structure in the country enabling artists to sell their products at a fair price means that these crafts are considered by the population to be secondary or even tertiary.

The diet of this population remains highly diversified. It is mainly based on traditional food crops such as cassava, sweet potatoes, bananas, potatoes, corn, sorghum, soybeans, beans, palm oil, yams, plus animal protein from Lake Kivu (fish) and livestock (goats, cows, poultry, pigs, etc.).

As for the health sector, there have been small improvements through the creation and emergence of new health facilities (hospitals, health centers, first aid stations), supervised by the Northern Health District, which are moderately supplied with medicines, often at a relatively affordable cost, thereby enabling a slight improvement in the quality of care. The recruitment and presence of a largely unqualified workforce means that a major effort is still needed to maximize the quality of care through the empowerment and training of this health personnel.

Kalehe District is divided into four autonomous rural health zones. This is the case for the four general hospitals (Ihusi-Kalehe, Kalonge, Bunyakiri, and Minova), one hospital center, 16 health centers, and nine health posts in Kalehe BCZS; 26 health centers and five hospital centers in the Bunyakiri Health Zone; and 26 health centers, five hospital centers, 15 health posts, and one general hospital in the BCZS/Minova. 12 health centers, 4 health posts, and 1 general hospital in the BCZS/Kalonge (Data collected during field surveys, November-December (2025)). Parents understand and support secondary education for their children, even though they have been burdened with the cost for years. Primary school education is free in official schools, despite the lack of supervision due to teacher dissatisfaction. Unfortunately, we note that fewer girls are interested in attending school. There are more primary schools than secondary schools, and they are affected by the lack of promotion of free education, which has not taken teacher satisfaction into account. A few higher education institutions are accredited and some are operational, but without their own infrastructure. Several school buildings are dilapidated and others have been destroyed. Literacy programs are organized by some local NGOs and churches for young people and adults who have not had the opportunity to study.

It should be noted that this activity is carried out on a small scale, mainly due to a lack of support. However, the need is too great, given the illiteracy rate in this District, which is close to 70% of its population, with more than 85% of women.

The inhabitants practice several religions, the majority of which are Catholic and Protestant. There are also Apostles of the Church of Jesus Christ, Muslims, Adventists, and certain revivalist churches.

Among the assets, we note the availability of potentialities favoring the development of the District such as natural resources, arable land, water: lakes and riv-

ers, forests, favorable climate, the existence of farmers' organizations, Basic Development Groups, ONGD, and grassroots organizations, local development initiatives, availability of markets, supply points for agricultural and finished products, the willingness of the population to take charge of their own development, and the presence of two national roads crossing the District (Nos. 2 and 3).

2.2. Main Socio-Economic Problems

The deterioration of socio-economic infrastructure destroyed or looted during the war, particularly schools, medical facilities, and administrative buildings. Children not attending school due to lack of funds to pay school fees (teachers' bonuses); Increased illiteracy due to the destruction of the school system, exposing young people to manipulation by armed groups, forced recruitment, etc. Lack of easy access to primary health care; Human rights violations and arbitrary rule; Destruction of village dynamics. The resulting breakdown of social ties due to mistrust between certain communities, families, and individuals (land conflicts; latent conflicts between communities, families, and individuals, which are one of the harmful effects of war (Rwandophones and certain tribes, for example). Undernourishment and malnutrition among children and even some elderly people; Lack of access to primary health care; Total disrepair of roads (National Roads 3 and 4), virtual non-existence of agricultural access roads in rural areas; Destruction and looting of livestock and other basic necessities, as well as a dramatic drop in crop yields due to the long period of disuse of agricultural activities.

Disruption of food security mechanisms due to the dramatic decline in food production caused by insecurity and repeated population displacement; Dramatic decline in income and increase in poverty. Soil degradation and depletion due to the lack of modern agricultural techniques and overexploitation of the land.

Added to this are a number of constraints such as Inadequate socio-economic infrastructure (schools, health centers, hospitals), bridges, ports/beaches, roads, and agricultural access roads; poverty, war, population displacement. Lack or insufficiency of financial and material resources, support organizations, poor condition of roads and agricultural access routes, technical training on agro-pastoral fishing practices and on storage, processing, and even marketing techniques. There is also rampant inflation, devaluation, and dollarization of the monetary system.

The resurgence of violence, rape, and other degrading and inhuman treatment, as well as the disregard for customs and traditions, have led to a vicious cycle of latent and/or open conflicts within communities. Hence the need to implement peace initiatives that are necessary and urgent for these communities.

Several actors and organizations are working in Kalehe District, including, for example, the World Health Organization, international and humanitarian organizations (MSF, FAO, CARITAS, ICRC), and national and local support organizations (CEAKI, APED asbl, GALE, CADRE, GALA/MINOVA, CDI/Kalehe PADEBU, AGIR asbl, IPPBU, CAD, VAS, etc.) Health institutions and training centers in

the four health zones. Religious denominations (Apostles of Jesus Christ, Catholics, Protestants, Muslims, Adventists, Anglicans. Schools and literacy and popular education centers, mainly run by churches. It should be noted that other humanitarian and UN organizations are currently responding to emergencies, mainly on behalf of people displaced by internal and external wars in North and South Kivu in Kalehe District.

2.3. Study Variables

Demographic variables: Dates, locations, groupings, categories, age groups, number of participants.

Living conditions: Impact of the road, monthly income level of the majority of people; type of housing; main means of subsistence; main crops grown; causes of death.

Social harmony and administrative functionality, main development stakeholders.

Proposals: Factors expected to contribute to well-being; factors contributing to social harmony; proposals concerning administration.

Impact of isolation: advantages of proximity to the lake?

Advantages of proximity to the road; Geographical disparity: most disadvantaged areas; causes of their poverty.

2.4. Ethical Considerations

The study received ethical approval from the scientific and institutional committee of ISDR-Bukavu. Prior to any data collection, participants were informed about the research objectives, the confidentiality of their responses, and their right to withdraw at any time without consequence. Informed consent was obtained either verbally—when literacy levels or local context did not permit written signatures—or in writing for participants able to do so. All data were processed anonymously and used solely for scientific purposes.

2.5. Sampling

We randomly selected and organized 30 focus groups and 6 key informant interviews, i.e., one informant per group for the 6 groups selected in Kalehe District (Lake coastal and mountainous zones), based on the convenience method. Each focus-group included 6 - 8 people residing in Kalehe District, regardless of their age, social status, gender, family situation. The selection of 30 focus group discussions (FGDs) and 6 key informants was driven by the intention to gather diverse and representative viewpoints from various socio-economic strata within the Kalehe territory. This number was deemed sufficient following the observation of data saturation—defined as the point at which new discussions no longer yielded novel insights or relevant new themes. Convenience sampling was chosen as it allowed for the selection of participants who were available, knowledgeable, and relevant to the study topic, particularly within a geographically isolated context

marked by logistical constraints.

Focus-group and interview data were coded on Kobo Collect, and frequencies were computed in the same software.

Age of respondents

Six groups of respondents are aged between 43 - 47. The same applies to the six groups of respondents aged 53 and over. Seven groups of respondents stated that they were aged between 33 - 37, compared with five groups of respondents who stated that they were aged between 28 - 32 and between 48 - 52, respectively. Two groups of respondents stated that their age group was between 18- 22, and 23- 27, respectively.

Administrative Divisions and interview locations

The interviews took place in Mukwidja, Ruhunde, Makelele, Rwamiko, Kasunyu, Kisongati, Kachiri, Karasi, and Buloho.

Nine groups of interviewees opined that they were residents of the Mubuku Division, while eight groups of interviewees were from Buzi. Finally, 7 groups of interviewees were from the Mbinga-Nord Division, while 6 groups of interviewees opined that they were from Bagana and Lubengera, respectively.

Respondent professional categories

19 groups of respondents said they were farmers, compared to 11 groups of respondents who said they were civil servants. Four groups of respondents stated that they were unemployed, while two groups of respondents stated that they were traders.

Operational framework

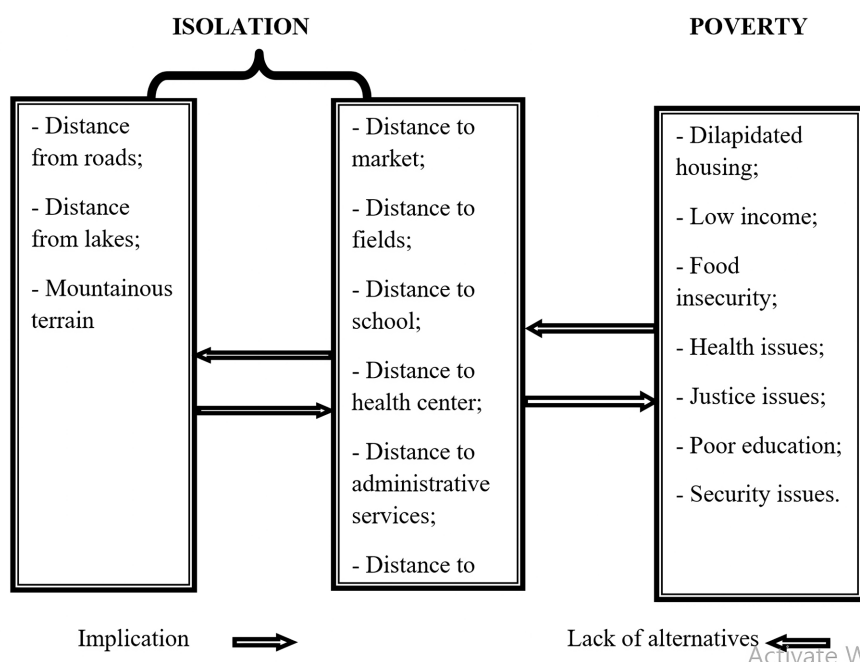


Figure 3. Conceptual model of the study.

Figure 3 summarizes the link between poverty indicators and geographic iso-

lation indicators. People living in villages far from roads and lakes, as well as residents of mountainous and highland areas, suffer from their remoteness from local and regional markets, agricultural fields, schools, hospitals and health centers, administrative services, and sources of drinking water. In this context, there is no way to connect to the water supply network or a potential electricity network. All of this leads to low production, low income, and poor access to medical care, justice and security services, and education. This results in a vicious cycle of poor housing, low education, health threats, and food insecurity, even though land is cheaper.

2.6. Data Collection Method

In order to collect the data needed to answer the research questions, we initially used participatory observation techniques, as we ourselves are nationals of Kalehe District. We were also able to conduct interviews with other residents on the topics discussed in the focus groups, archiving the information on Kobo collect. Finally, we also used documentary research and questionnaires throughout the course of this work.

3. Results and Discussion

3.1. Indicators of Isolation

Distance to the main road or lake route

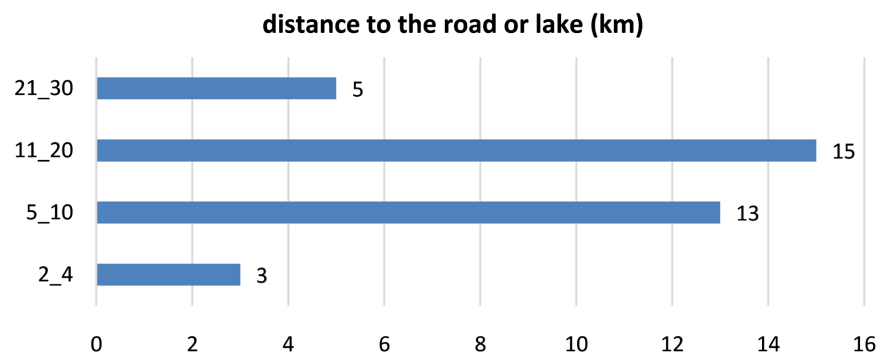


Figure 4. Scores for distance intervals to roads or lakes (km).

Figure 4 shows that, considering all villages, several are very far from the road or waterway. In the modal class, these distances to the road vary from 5 - 20 km, which is very considerable. There are few cases where participants estimated this distance to be a minimum of 2 - 4 km or even a maximum of 20 - 30 km. The road and the lake are at low altitude (approx. 1500 - 1600 m), while the District reaches altitudes of 2000 m in the highlands. Looking at the map, we can see that roads are rare in Kalehe District. Apart from the unpaved national road that crosses the Kahuzi-Biega National Park and passes through the Buloho chiefdom and the center of Buhavu, there are a few dilapidated roads of local interest scattered in the northeast of the Buhavu chiefdom and very few in the southeast. There are virtu-

ally no roads in the southwest of the vast Buhavu area. Lake Kivu, meanwhile, only borders the northeast coast of Buhavu. In short, very few villages in Kalehe have access to roads or the lake. Isolation dominates the entire scene.

Lakes can provide food resources (fishing) that contribute to the livelihoods of rural communities (Namisi, 2001). Water quality and the health of lake ecosystems directly influence the availability and quality of these resources. Lakes can also support tourism, generating income and jobs (Demková et al., 2022; Kulish, 2022; Liu et al., 2023; Bosquez et al., 2023; Batyk, 2011; Saparov et al., 2024; Çelik & Şenay, 2023; Mănescu et al., 2024; Sadeghi & Seidaiy, 2025; Bielska et al., 2022; Yarotskaya, 2020, pp. 191-201). However, sustainable management is essential to avoid conflicts of use and ensure the continuity of these benefits.

Distance to a market

Considering all villages, local markets are also located at a considerable distance, between 5 - 10 km in the modal class and 15 - 20 km in the next class (Figure 5). Distances of less than 3 km to the market are less frequent.

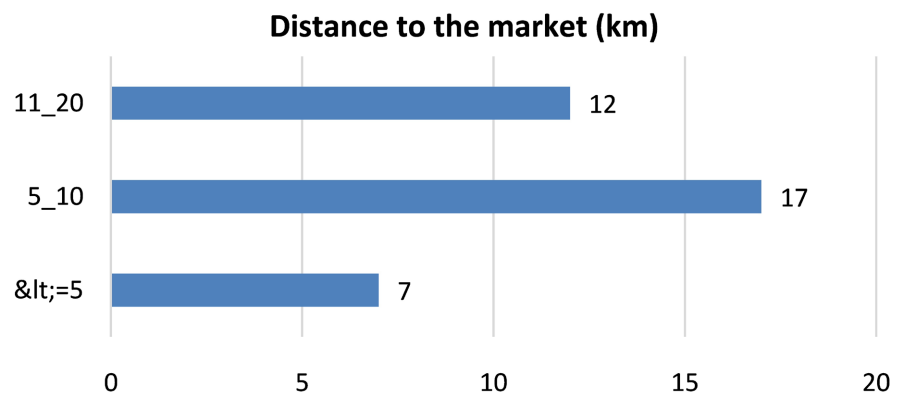


Figure 5. Scores for distance intervals to the local market (km).

When we consider that all agricultural products are carried on women's backs, or sometimes on their heads, in this vast District where there are no horses, donkeys, or other draft animals, we can truly speak of drudgery, especially for women and children.

Distance to primary school

Similarly, in the most disadvantaged villages, the school is very far from people's homes. Children walk several kilometers to get to school. The distance classes are bimodal: between 5 - 10 km and 11 - 15 km (Figure 6). In the fewer, more privileged areas people walk 3 - 4 km, while children from the least privileged villages walk more than 15 km to school, which is more than a 3-hour walk. How long can they keep up this pace before giving up?

Distance to a health center, referral hospital, or drinking water source

In the most disadvantaged villages, sick people and mothers about to give birth travel long distances to reach maternity wards and health centers. There are two groups of villages where the health center is located between 5 - 10 km and 11 -

15 km away (Figure 7). In the best cases, the health center is less than 5 km away. In even more disadvantaged villages, health centers are located between 15 - 25 km away.

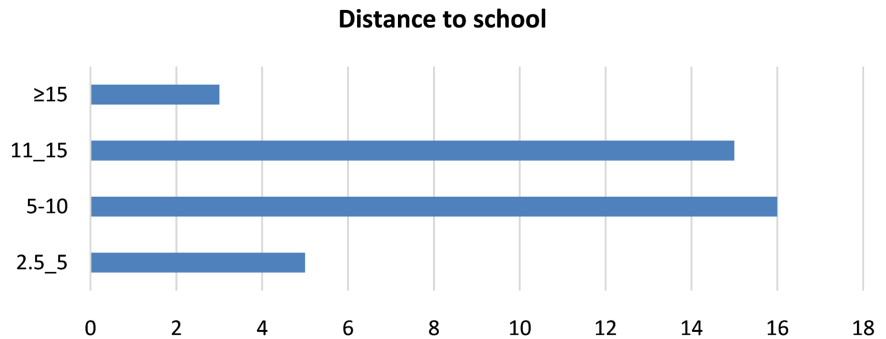


Figure 6. Scores for distance categories to school (km).

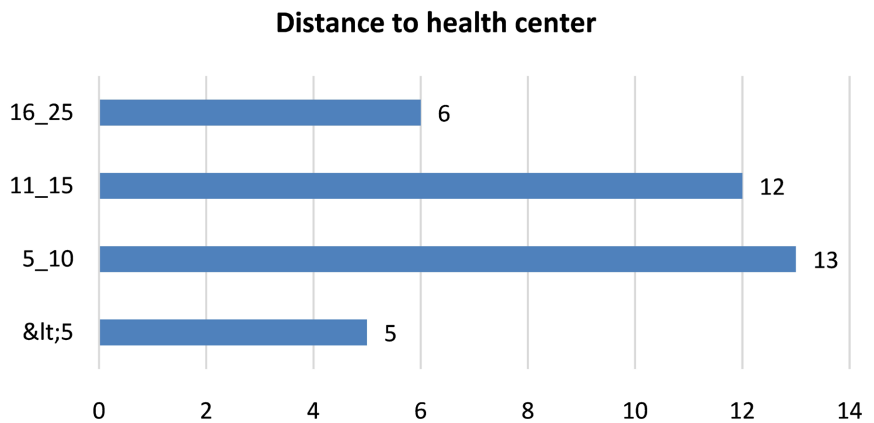


Figure 7. Scores for distance intervals to the health center (km).

In addition, to reach a referral hospital, residents travel 15 - 20 km and even 20 - 25 km in the worst cases. In the most disadvantaged villages, people also have to travel long distances to fetch drinking water from the source, either 10 - 15 km or even 20 - 25 km (Figure 8).

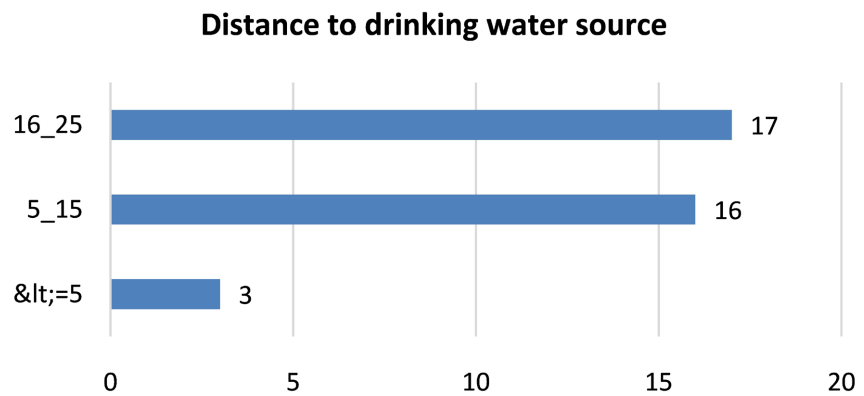


Figure 8. Scores for distance intervals to drinking water sources (km).

Limited access to essential services is a determining factor. Rural areas often suffer from insufficient access to healthcare, education, sanitation, and infrastructure (roads, electricity, internet) (Sarfaraz et al., 2021; Gomez et al., 2019; Ile et al., 2025; Lesala et al., 2025; Ogunniyi et al., 2024; Parikh et al., 2021, pp. 902-915; Guerra et al., 2024; Dekker et al., 2015, pp. 3535-3546; Alberta, 2024; McCarty & Taylor, 2022). This inequality of access has direct consequences on health, education, and overall quality of life.

3.2. Impact of Isolation on Well-Being

All groups of interviewees clearly recognized that isolation has a negative impact on well-being.

Advantages of living near the highway or lake

The most perceived advantages of living near the lake are, in equivalent scores, diverse recreational activities, including swimming and the distribution of agricultural products. In fact, Lake Kivu facilitates the easy distribution of surplus production from rural areas to consumption centers. Others highlighted access to water for bathing and washing clothes. A few mentioned the advantage of a peaceful living environment (Figure 9).

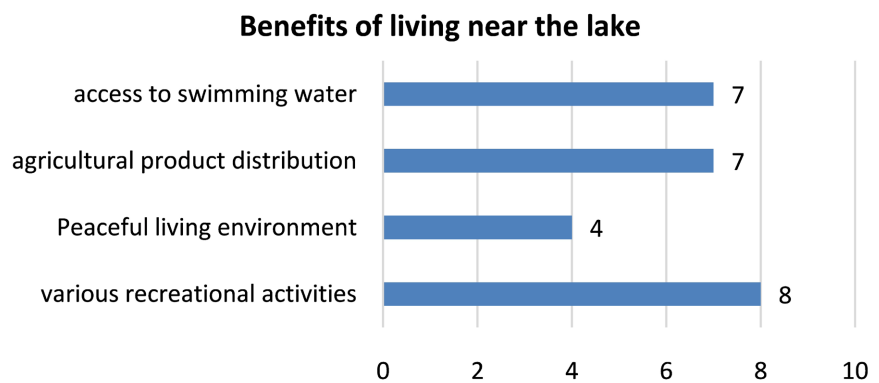


Figure 9. Scores for perceived advantages of proximity to the lake.

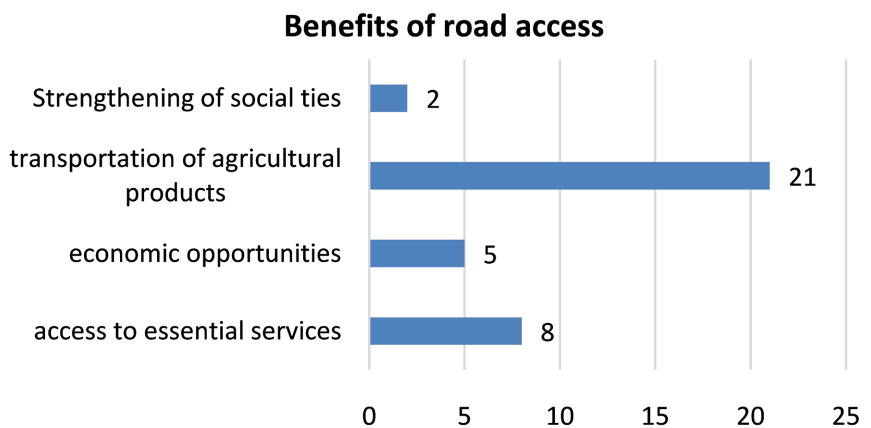


Figure 10. Scores for perceived advantages of proximity to the road.

The easy transport of agricultural products is strongly perceived as an advantage of living near the road (Figure 10). The advantages of living near the road also include access to essential services and economic opportunities. Even the strengthening of social ties is mentioned among the advantages of living near the road.

However, some advantages of living far from the lake and the road were mentioned, including more space and lower costs. There is also less flooding and fewer water-related risks, as well as no nuisances related to tourism and water and air pollution.

Socioeconomic effects of isolation

Isolation corresponds to poor infrastructure and significant disparities between localities and urban areas. Its main effect is to increase rural exodus. It causes low growth rates in the agricultural sector. It implies remoteness and enormous distances to travel to access services.

Whether geographical, social, or structural, isolation has significant negative consequences on the well-being of rural populations. Geographical and social isolation leads to increased feelings of loneliness and isolation, negatively affecting emotional and mental well-being (Cahyono & Adiwaty, 2025; DeJohn et al., 2025; Freak-Poli et al., 2021; Girmay & Singh, 2019; Gonçalves et al., 2020; Jiang et al., 2024, p. 13591053241301201; Lee & Kim, 2024; Marques et al., 2024; Mushtaq & Khan, 2023, pp. 143-156; Nguyen et al., 2024; Pratt et al., 2023, pp. 394-401; Rahiem et al., 2021; Ribeiro et al., 2025). The absence of strong social networks amplifies these feelings, especially among older adults (Galloway & Henry, 2014, pp. 43-79; Henning-Smith et al., 2022, pp. 282-301; Sánchez-Moreno et al., 2020, pp. 287-299). Isolation can indirectly affect physical health by limiting access to medical care and increasing stress, which can exacerbate existing health problems (Nsiah et al., 2024).

Isolation has socioeconomic consequences. These include difficulties in accessing essential services. Geographic remoteness makes it difficult to access healthcare, education, jobs, and other essential services (Butterworth et al., 2024; Caspary & O'Connor, 2003; Gajos et al., 2022, pp. 1305-1321; Henriquez & Ahmad, 2021; Marques et al., 2024; Muhamad & Kusuma, 2024; Nsiah et al., 2024; Palomin et al., 2023, pp. 1442-1451; Henning-Smith et al., 2022, pp. 282-301; Ratna et al., 2023). This can lead to inequalities in health and well-being, particularly affecting vulnerable populations. The lack of employment opportunities in rural areas can lead to poverty and food insecurity, exacerbating isolation and poor well-being (Mdiya et al., 2025). Terrain affects **access to services**. Rugged terrain makes it difficult to access essential services such as healthcare, education, and infrastructure (roads, electricity, internet) (Xu et al., 2023). Difficult terrain makes the construction and maintenance of these infrastructures more costly and complex (Kumar et al., 2025; Mageo et al., 2025; Patterson et al., 2011, p. 1710). The study on India's rural road program (Kumar et al., 2025) highlights the importance of road infrastructure in improving accessibility.

Socioeconomic impact of insecurity and causes of premature deaths

The lack of trust and tolerance and the absence of community support are perceived as consequences of insecurity. There is a lack of contact between different communities and a lack of volunteer work within communities, and therefore a lack of collaboration.

The most commonly perceived cause of premature death is limited access to healthcare. Problems related to poverty and nutrition are also major causes of premature death in Kalehe District. Geographical isolation, poor sanitary conditions, and a lack of education and health awareness are also perceived as causes of premature death.

3.3. Indicators of Standard of Living

Monthly income level

In rural areas, only agricultural activities provide income for residents. Political and civil society actors should intervene in rural areas to support farmers by providing them with the necessary agricultural training, improved seeds and pesticides, and modern agricultural tools to replace archaic tools such as hoes, machetes.

The inhabitants clearly stated that they only have an income when there is an agricultural harvest (**Figure 11**). For one-fifth of the participants, their monthly income is unknown and undefined.

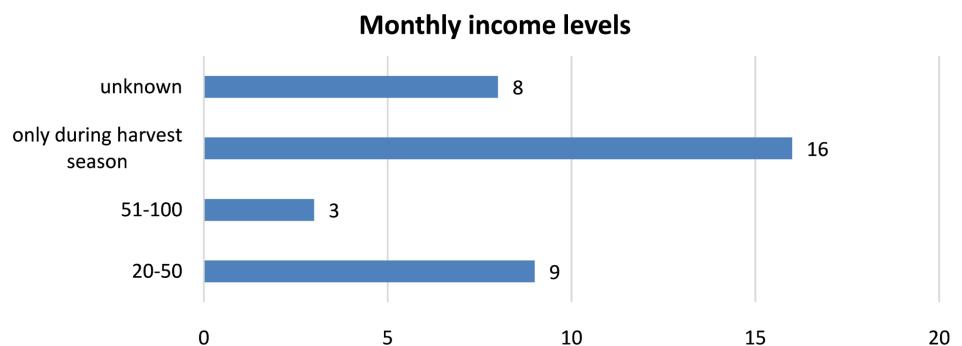


Figure 11. Estimated monthly income levels.

For the vast majority, income generation is facilitated by the diversification of agricultural activities, which is the main factor. Capacity building and various training courses would have a positive impact on income generation. Improving rural infrastructure is widely desired as a means of boosting income generation.

Several major themes emerge from previous studies. There are socio-economic factors. Limited access to financial resources is a determining factor in well-being, affecting access to healthcare, education, and adequate nutrition (Sarfaraz et al., 2021; Deviantony et al., 2024; Sun, 2025; Nóbrega et al., 2021; Lesala et al., 2025; Ramli et al., 2023; Ogunniyi et al., 2024; Parikh et al., 2021, pp. 902-915; Liang et al., 2022; Curl et al., 2020; Alberta, 2024; Kasaudhan et al., 2024; Sinija A. S. &

Vinod Kumar K. P. (2024). There is a direct link between income level, access to essential services, and life satisfaction in rural areas.

Types of houses

In terms of buildings, three types of houses were observed (Figure 12): (a) mud houses with corrugated iron roofs and few amenities, (b) semi-durable houses with poor ventilation, and (c) thatched houses with few amenities (Figure 12).

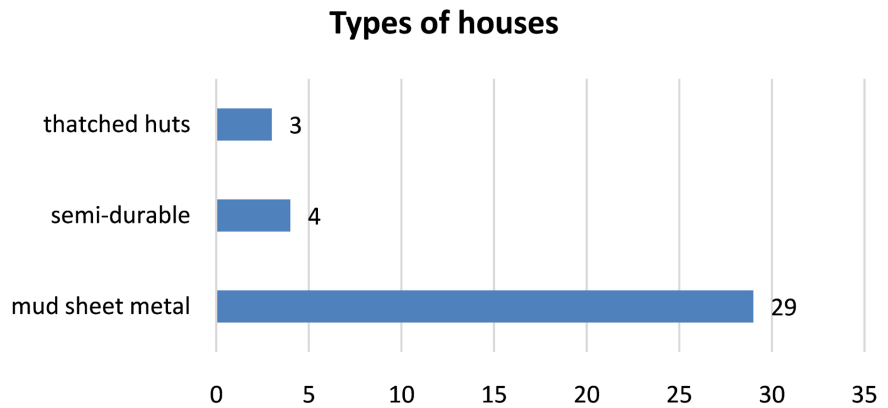


Figure 12. Scores for types of houses.

Semi-durable houses (Figure 13) have well-reinforced walls and foundations. Built to a reasonably high standard of comfort, these are the most expensive houses in all the Divisions. Most of these houses are located along main paths and/or roads and house small shops. These houses are more comfortable and have a longer lifespan than all the other houses. Their construction requires a great deal of money compared to the socio-economic conditions of most inhabitants of the communities in Kalehe District. In general, these houses are small in size.



Figure 13. Semi-durable houses. E.P Makutano primary school in the village of Ramba with a mound of crystalline limestone in the background.

Houses made of mud and iron-sheet roof and under-equipped (**Figure 14**) are more or less similar to the first category, but their durability is very low because they do not have the necessary comfort to withstand certain shocks. There are also some new ones, but not many. These houses are generally used for family housing.



Figure 14. Mud and iron-sheet roof houses.

Thatched houses with inadequate facilities (**Figure 15**) are houses with roofs covered with thatch. They make up the majority of the houses in our study area and belong to the poor population of the Divisions surveyed. They are generally medium-sized, with an average length of 10 m and width of 7 m. They offer very little comfort and are vulnerable to bad weather.



Figure 15. Thatched houses.

Mud houses with corrugated iron roofs and poor facilities are clearly predominant in the area. Semi-durable, less well-ventilated houses and thatched houses with poor facilities are perceived as having equivalent scores.

Main means of subsistence for the majority of the population

The economic environment in Kalehe District is not very diverse. The activities carried out by the population of the District are not a matter of chance. Kalehe District is rural. In fact, most activities are clearly oriented towards agriculture and livestock farming. It should be noted that there is a close link between agriculture and livestock farming. The former provides food for the animals and the latter feeds agriculture through animal manure. Moreover, there is in fact a close relationship between agriculture and industry. Agriculture receives the tools and materials necessary for its development from industry. In turn, it provides raw materials to industry. Agricultural products require industrial processing in order to be preserved for long periods of time. It is this processing that increases the added value of agricultural products.

Agriculture remains a basic means of subsistence. The most fundamental human need is to have enough food.

Agriculture is the main activity in Kalehe District (Figure 16). It is followed by livestock farming. The two are often combined. Trade is minimal.

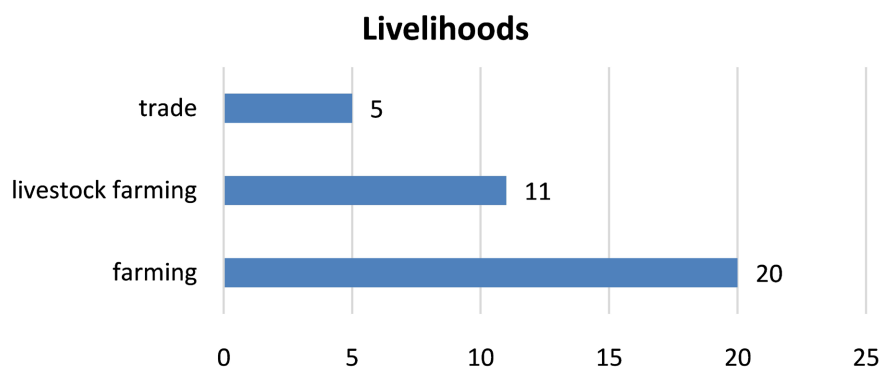


Figure 16. Scores for the main means of subsistence.

We note that all groups of interviewees mentioned the practice of mixed farming in their various communities. Almost all rural households in Kalehe District own fields where they grow food for their own subsistence. However, only a small proportion of the income from these activities is in monetary form. It can be said that the inhabitants of Kalehe District engage in agricultural activities (subsistence farming and livestock farming) for the sole purpose of self-consumption.

Factors opined as positively influencing well-being, subsistence, and the cost of living

Support for agriculture would have a major impact. The stability of the political environment is not to be overlooked. Strengthening social protection and access to infrastructure are greatly desired. In fact, one of the causes of poverty among the population in Kalehe District is the lack of infrastructure. Due to the lack of

transportation, the remoteness and inaccessibility of certain communities, especially during the rainy season, the mobility of material and human resources remains very complicated, which lowers the level of development in several communities in Kalehe District.

Promoting sustainable agriculture and rural entrepreneurship and strengthening socioeconomic infrastructure would reduce the cost of living. Improving transport infrastructure would reduce the cost of living. Small businesses must be promoted. In fact, the inadequacy and/or absence of infrastructure such as electricity, telecommunications, and all-season roads severely hamper socioeconomic development.

Sustainable agriculture is mentioned as having a positive impact on livelihoods. Strengthening social capital and rural infrastructure are also mentioned. Access to finance and banking services, as well as diversification of economic activities, are also priorities. Agricultural diversification is essential to improve food conditions. The promotion of agricultural cooperatives is desired.

The coverage of basic needs by poor households is disastrous. Participants clearly emphasized that there is a lack of coverage of basic needs by poor households.

Food insecurity has a considerable impact. Limited access to nutritious and regular food contributes to malnutrition and health problems, particularly among children (Deviantony et al., 2024; Sun, 2025; Nóbrega et al., 2021; Bodhare et al., 2025; Ogunniyi et al., 2024; Parikh et al., 2021, pp. 902-915; Curl et al., 2020; Murray et al., 2015). Several studies address the impact of malnutrition and food insecurity on child development and family well-being.

Factors perceived as hindering well-being in Kalehe District

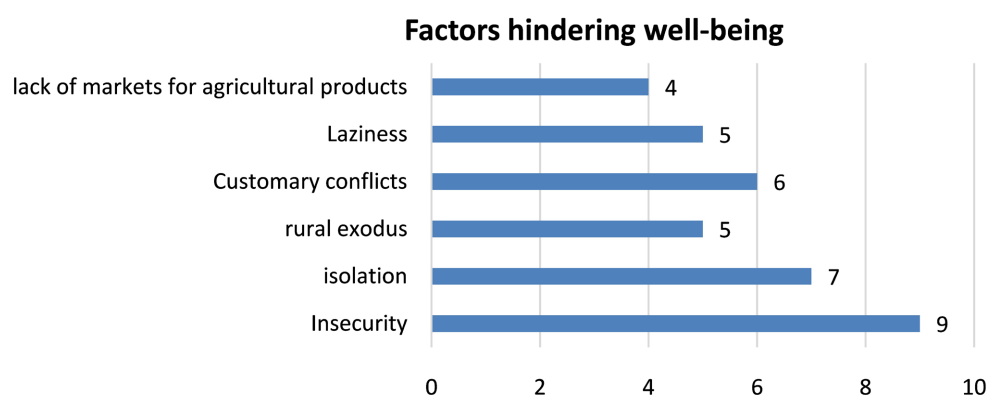


Figure 17. Scores for factors hindering well-being.

The factors perceived as hindering well-being (Figure 17) have very similar scores. These include recurrent insecurity, triggered by political instability, which leads to the destruction of already poor infrastructure. Isolation is also perceived as a major cause of poverty. Rural exodus and laziness have also been blamed as causes of poverty. In fact, rural exodus is due to the attractive factors of urban

areas and the repulsive factors of rural areas for young people, which, in urban areas, leads to an increase in the supply of labor and, in turn, fuels unemployment. The lack of markets for agricultural products and customary conflicts have also been cited as causes hindering well-being in Kalehe District. The isolated location of most communities in Kalehe District makes it difficult for them to compete for development projects.

3.4. Social Harmony, Administrative Functionality, and Key Development Stakeholders

Tribalism undermines social harmony. Community unity, social cohesion, and family or clan hospitality are the main priorities that are considered satisfactory. Community dialogue and the promotion of community participation are at the forefront. Family solidarity and the transmission of values have a positive influence on social harmony, even if the improvement of socio-economic conditions is perceived as a catalyst for social harmony.

The administration is perceived as irresponsible with regard to the needs of its citizens. The administration itself has been destabilized by insecurity. Many participants perceive NGOs as the main actors in economic development in the various Divisions within Kalehe District. Others believe that it is the communities and local populations that contribute to economic development. Some believe that the local development committee is the main actor in development.

Legal and institutional stability can strengthen public administration, provided that community participation and accountability are ensured. Capacity building for local actors would boost public administration. Land use planning is also essential. Investment in infrastructure and basic services and the promotion of education and training are imperative for the development of public administration.

3.5. Typology of Isolation Indicators

Infrastructure, health, social, and economic isolation

Infrastructural isolation implies difficulty in accessing main roads, lake routes, or transport infrastructure (Table 1). Typical indicators here are walking or transport time to reach a road or market, the absence of agricultural access roads, and the dilapidated state of existing roads. From this point of view, we classify the Divisions concerned in Table 1. The classification takes into account villages that are far from the road, even if the road passes through the community.

Table 1. Classification of communities according to infrastructure isolation.

Type of isolation	Communities concerned
Absence of roads	Ziralo, Mubuku,
Dilapidated roads	Bagana, Karali, Ndando, Musenyi
Remoteness from main roads	Lubengera, Bitale, Mulonge

Health and social isolation (**Table 2**) refers here to the difficulty of accessing essential services such as healthcare, education, and drinking water. Typical indicators include the time it takes to reach a health center, school, or water source, poor sanitary conditions, and unequal access to healthcare. From this perspective, we have classified the communities concerned in the table below.

Table 2. Classification of administrative divisions according to health and social isolation.

Type of isolation	Divisions
Limited access to healthcare	Buzi, Mubuku, Mbinga-Nord, Bagana
Distance from schools	Ndando, Musenyi, Lubengera
Lack of drinking water sources	Buzi, Mubuku

Economic isolation is defined by weak integration into economic circuits, implying a lack of opportunities or outlets. Its typical indicators are low sales of agricultural products, lack of markets, and poverty linked to isolation. From this perspective, we classify the Divisions concerned in **Table 3**.

Table 3. Classification of administrative divisions according to economic isolation.

Type of isolation	administrative Divisions
Low sales	Mbinga-Nord, Mubuku, Buzi
Lack of outlets	Bagana, Ndando, Karali
Structural poverty	Lubengera, Mulonge

Territorial and political isolation

Territorial and political isolation is defined as isolation linked to geographical, political, or customary factors. Its typical indicators are tribalism or customary conflicts, the absence of customary authority, and territorial marginalization. From this perspective, we classify the administrative Divisions in **Table 4**.

Table 4. Classification of administrative divisions according to *territorial and political* isolation.

Type of isolation	administrative Divisions
Customary conflicts	Bagana, Lubengera, Mubuku
Geographical isolation	Mbinga-Nord, Karali
Absence of authority	Buzi, Mubuku

3.6. The Most Disadvantaged Areas

These communities are characterized by: An accumulation of territorial disadvantages, namely: remoteness, lack of infrastructure, and physical isolation. They face multiple vulnerabilities: poverty, limited access to social services, and political or customary marginalization. Low local resilience: few economic opportunities

and weak community organization capacity.

In the Buzi community, the traditional chief is always absent and is represented by an administrative secretary. In the Mubuku community, the development of drinking water sources remains a major challenge, as only farmers are involved. The village of Ramba, which is the economic heart of the administrative Division, remains embroiled in customary conflict, a situation that weakens the economy and security of the administrative Division as a whole. In the Mbinga-Nord administrative Division, most of the villages on the high plateau remain completely abandoned, which gives armed groups the opportunity to regularly destabilize the population abandoned by the administrative authority responsible for its security.

Geographical isolation exacerbates social and economic vulnerabilities, especially in rural and mountainous areas. Transit areas are ambivalent: they offer opportunities but expose people to security risks and territorial instability.

3.7. Geographical Disparities and Most Disadvantaged Communities in Kalehe

Inequalities in access to infrastructure due to a lack of roads or roads in poor condition are mentioned. Economic inequalities and lack of access to essential services are noticeable due to the distances that must be traveled to access services. Inequalities in access to healthcare due to distance have been highlighted. Others mentioned unequal access to different technologies and information due to the distance to road infrastructure.

The Ndando, Musenyi, and Karali communities are considered the most disadvantaged in Kalehe (Figure 18).

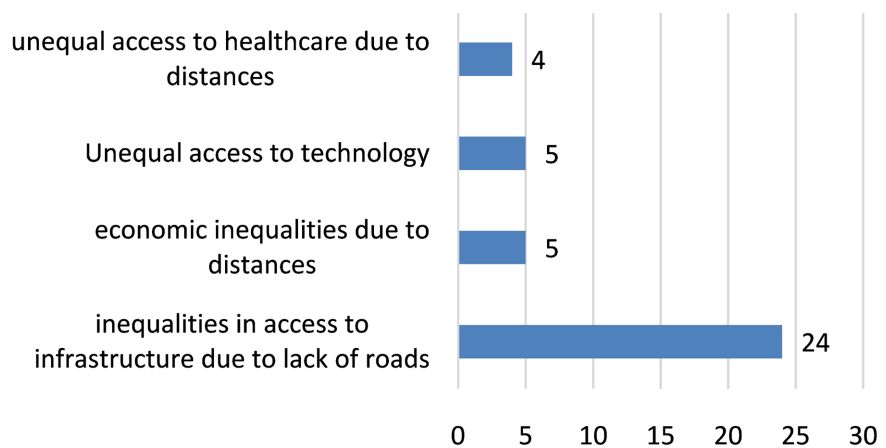


Figure 18. Geographic disparities.

The most isolated villages and their territorial, and social typology

These villages are mentioned as having difficulties accessing main roads, health and education infrastructure, and markets. They are often associated with long travel times (up to 6 - 8 hours on foot) or a complete lack of road access (Table 5).

Table 5. Social and territorial typology of the most isolated villages.

Village/administrative Division	Access time (max)	Type of isolation	Social/territorial characteristics
Ngokwe, Misima, Chifumbi	5 - 8 hours' walk	Highly isolated, no national roads or lake routes	Geographical isolation, tribalism, poverty, lack of profitable activities
Ramba, Mushunguti, Chigoma	3 - 5 hours' walk	Isolated due to lack of agricultural access roads	Poor access to healthcare, high levels of insecurity, dependence on subsistence farming
Lowa Numbi, Murambi, Kitembo	6 hours	Isolation due to distance from service centers	High plateau territories, lack of infrastructure, high economic vulnerability
Katobolo and Ramba	2.5 - 3 hours' walk	Geographical isolation	Structural poverty
Bubale I & II, Kabulu I & II	3 - 4 hours	Isolation due to territorial marginalization	Lack of markets, dilapidated infrastructure, poor access to essential services
Chigoma/Karasi	3 hours' walk	Extreme isolation, lack of national roads	Lack of markets, illegal land sales, insecurity, absence of traditional authority

These villages can be grouped into four main categories according to their location:

1) High plateau villages with no road access

Examples: Lowa Numbi, Murambi, Shanje

Physical isolation, difficult access to services, heavy dependence on subsistence farming.

2) Forest or semi-mountainous villages with weak governance

Examples: Ngokwe, Misima, Chifumbi

Tribalism, lack of structured economic activities, chronic poverty.

3) Peripheral villages in customary or political conflict

Examples: Katobolo and Ramba

Massive population displacement, power struggles, lack of institutional support.

4) Villages marginalized despite their relative proximity

Examples: Bubale I & II, Kabulu I & II

Social marginalization, dilapidated infrastructure, poor access to markets.

The Ndando, Musenyi, and Karali communities are considered the most disadvantaged in Kalehe.

3.8. Strategic Priorities

Finally, we present here some strategic priorities based on the results, aimed at improving living conditions, well-being, and socioeconomic development in

Kalehe District. These include opening up the region and improving infrastructure. This involves rehabilitating rural roads and lake routes to facilitate access to markets, schools, health centers, and hospitals. Transport infrastructure suitable for the rainy season should be put in place to reduce the isolation of villages. Access points to drinking water should be developed in remote areas. Another priority is the strengthening of agriculture and food security. Agricultural diversification and mixed farming should be promoted to improve nutrition and incomes. Support should also be given to local agricultural cooperatives by providing them with improved seeds, modern tools, and access to credit, and local processing of agricultural products should be encouraged to increase their added value.

Access to basic social services is essential, particularly by building schools and health centers in the most disadvantaged communities (Ndando, Musenyi, Karali). Health, nutrition, and hygiene awareness programs should also be implemented. Strengthening the capacities of medical and educational personnel in rural areas is also important. Social cohesion and local governance in the South Kivu province are also priorities, through the promotion of community dialogue and citizen participation to strengthen trust and tolerance and combat tribalism and customary conflicts through mediation and local justice mechanisms, as well as training public administration officials in planning, accountability, and participatory management.

Rural economic development and entrepreneurship will involve encouraging small-scale commercial activities and local entrepreneurship through technical training and access to financing. The creation of rural economic zones with basic infrastructure to attract investment will be necessary. Support programs for young people and women will need to be put in place to stimulate rural employment.

To reduce geographical inequalities, priority must be given to investment in the most isolated and disadvantaged areas, and to ensuring the equitable distribution of public services and economic opportunities between urban and rural areas. The integration of information technology to improve access to education, health, and information will be imperative.

It will be essential to ensure community safety and resilience, strengthening security measures in at-risk areas to protect populations and infrastructure. It will also be necessary to implement risk management plans for natural disasters (floods, landslides) and support community initiatives for resilience and solidarity.

3.9. Study Limitations

This research presents certain limitations, notably the small sample size and the use of convenience sampling, which may restrict the generalizability of findings to the entire Kalehe District. Additionally, logistical and contextual constraints (such as inaccessible areas and language barriers) may have influenced the richness of the data collected. Despite these limitations, the results offer a deep and contextualized understanding of the factors affecting the well-being of the local population.

4. Conclusion

The District of Kalehe, located in South Kivu province, faces major challenges in terms of rural development, access to infrastructure, food security, and local governance. A survey of 36 groups of respondents reveals geographical disparities, high poverty, structural isolation, and dependence on subsistence agriculture. The study highlights the multiple socio-economic challenges facing rural populations, while revealing local dynamics that can be mobilized to improve their well-being. The results show that the majority of households live in precarious conditions, with unstable incomes and a high dependence on subsistence agriculture. Geographical isolation, lack of basic infrastructure, insecurity, customary conflicts, and the absence of structured markets are major obstacles to local development.

Despite these constraints, local communities show remarkable resilience, notably through the widespread practice of mixed farming, community engagement, and recognition of the role of NGOs and cooperatives in development. The positive factors identified—such as agricultural diversification, support for agriculture, local capacity building, and political stability—offer levers for action to improve living conditions.

The study also highlights the strategic importance of road and lake infrastructure in providing access to essential services, education, health care, and economic opportunities. Geographic disparities, long distances to markets, schools, and health centers, and the effects of insecurity on social cohesion call for targeted and coordinated interventions.

In short, the development of Kalehe District requires an integrated approach focused on:

- Opening up the region and improving infrastructure;
- Strengthening sustainable agriculture and rural entrepreneurship;
- Promoting responsible and inclusive local governance;
- Investing in basic social services;
- Supporting community solidarity and dialogue mechanisms.

These guidelines must be backed by strong political will, the mobilization of local actors, and effective coordination between development partners. Only then will Kalehe be able to transform its vulnerabilities into sustainable opportunities for its people. In addition to the above strategic priorities, our recommendations can be summarized as follows:

1) Infrastructure and access: Rehabilitate rural roads and lake routes, develop transport infrastructure that is accessible in all seasons, create local markets for the sale of agricultural products

2) Support for agriculture and rural entrepreneurship: Promote agricultural diversification and sustainable agriculture (75% of respondents); Strengthen farmers' technical capacities; Encourage agricultural cooperatives to improve food security

3) Governance and local administration: Stabilize the legal and institutional framework (41.7%); Strengthen the capacities of local actors and promote com-

munity participation and accountability.

4) Access to basic social services: Build schools and health centers in remote areas; Implement nutrition and health awareness programs; Facilitate access to drinking water and energy

5) Social cohesion and security: Promote community dialogue (55.6%); Combat tribalism and strengthen social ties; Implement mechanisms for resolving customary conflicts

6) Priority areas for intervention: The most disadvantaged communities: Ndando (47.2%), Musenyi (33.3%), Karali (19.4%) and the most isolated villages: Chifumbi, Erunga, Murambi, Mumbiri.

In terms of social science and rural development research, we refer to a) the Theory of Structural Isolation. The premise is that geographical isolation acts as a structuring factor in rural poverty, conditioning access to services, markets, and opportunities. The hypothesis is that “the further a community is from basic infrastructure (roads, lakes, hospitals), the lower its standard of living, regardless of its agricultural potential”; b) The theory of Resilience through Polyculture. The widespread practice of polyculture is an adaptive response to isolation and food insecurity. In isolated areas, crop diversification helps stabilize livelihoods despite the lack of commercial outlets. All these are avenues for future research.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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