

CONSTANT SYNOPTIC LANDSLIDE FROM LUHORE TO BUHOZI BUHOZI IN
KABARE TERRITORY NEAR BUKAVU/RDC



1. BACKGROUND

During the week of February 19 to 25, 2024, several alerts, through reports and images on the media and social networks, were issued on major ground deformations observed in Luhore, village of Buhozi (geographical coordinates: 2°33'15,52"S ;28°52'38,52"E).

On February 23, 2024, a second alert was issued on the situation in the Ruzizi valley, following a land mass rupture that led to the formation of a dam lake. As the water rose upstream, it submerged houses and fields along the banks. Downstream of the dam lake, the Ruzizi II hydroelectric power station and a number of large rural centers, including Kamanyola, would be at risk if the retained water, mixed with the materials mobilized during the rupture, were to be carried to these sites in large quantities.

After all this information, I decided to visit the sites to assess the situation and identify the extent of the losses and damage.

Overall, the aim was to inform the humanitarian, provincial and civil protection authorities of the damage recorded, with a view to assessing the appropriate measures to be taken to assist the victims and reduce the current risk levels. More specifically, the aim was to:

- Identify and count "material and human" losses and damage;
- Assess the level of current damage and potential future damage;

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- Gather local people's perceptions of the conditions in which current events are taking place, how they function and the levels of risk they are exposed to.

2. DESCRIPTION OF THE PHENOMENON

The Luhore instability occurred at the point of contact with the Kamagema river. It is a new rotational landslide. The landslide activity had started with cracks on the road and in houses on February 11, 2024. This cracking was followed by the progressive movement of the displaced mass downstream through gaping ruptures.

On February 24, 2024, the height of the main escarpment was > 3 m, reaching over 5 m in places. Thus, this is a deep landslide according to the classification of landslides based on the height of the main escarpment in the region (Depicker et al., 2020; Dewitte et al., 2021; Maki Mateso et al., 2023; Mugaruka Bibentyo et al., 2024).

Mapping of the directly affected area reveals that it is approximately 1.3 ha in size, 108 m long and 185 m wide. According to the landslide size classification (McCull and Cook, 2023), this is a medium-sized landslide. In and around this landslide, the Kamagema river/ravine is too active through lateral and vertical incision resulting in bank subsidence and landslides.

If the dynamics of these instabilities (landslides and gullies) continue or accelerate, the instability may widen and affect a larger area. Considering a buffer zone of 25 m, we estimated that the instability would affect an area of around 3.3 ha, profoundly affecting the morphology of the terrain.

The Luhore landslide was triggered on a 12° slope (the area containing the main escarpment), in predominantly clayey soil (over twenty metres deep on the river bank) resulting from the weathering of basalts, with peat in places. Water springs have been observed in this landslide on the river bank. The presence of these springs indicates the permanence of water in the soil during the period of landslide initiation and activity. Based on Google Earth archive images, a reduction in vegetation has been observed in this area over the last 20 years.

The dynamics of the Kamagema River, the nature of the soils, the presence of water in the soil as a result of rainfall and changes in land use and occupation are a combination of factors that may have played an important role in the occurrence of this landslide. However, studies of these different factors may improve understanding of how and to what extent each of them would have influenced this phenomenon. The morphology and dynamics of this landslide from the appearance of the first cracks on February 11 to the date of our observations (February 24, 2024) show that this landslide is only in its initiation phase and that movement will continue and may accelerate in the event of heavy or long-lasting precipitation, for example.

As for the land instability towards Lukula (Left bank of the Ruzizi River) observed on February 23, 2024 on the Rwandan side of the Ruzizi River opposite Lukula (DRC side) is an activity in a larger (94 ha) deep rotational landslide dating back to before 1959 and whose recently affected area has been active since 2013. The area affected on February 23 covers 10 ha over 450 m in length and 250 m in width. This area corresponds to that of medium-sized landslides (between 0.1 and 50 ha) according to the classification of McCull and Cook (2023).

Observations from Lukula (DRC) show that the activity was deep-seated and occurred in several phases, with three major phases as indicated by the three source zones at the main escarpment (Figure 1). Two source zones (1 and 3) are associated with a flowslide-type process, and the third (2) with a flow-type process.

On the evening of February 24, 2024, the accumulation zone of the displaced mass was incised by the waters of the Ruzizi River, leaving part of it on the other bank of the river on the Congolese side (Figure 1). The part of the landslide on the Rwandan side still retains part of the dam lake created by the landslide activity.



Figure 1. Activity in an old landslide in the Ruzizi on the Rwandan side. The red dashed lines represent the area that moved on February 23, 2013. The various source zones and the remaining part of the dam lake are indicated.

3. IMPACTS

The landslide activity of February 23, 2024 created a dam lake on the Ruzizi River, causing flooding upstream and a gradual reduction in water levels downstream, particularly at the Ruzizi II hydroelectric power station (Figure 2). The flooded area covers 18 ha, 96% of which is agricultural land and 4% inhabited (Figure 2). A large proportion of the flooded fields and houses were still under water on February 24, 2024 (11am), but the water level had already fallen by 1m.

The gradual drop observed at the Ruzizi II hydroelectric power station had disrupted the plant's operation for a time, but the greatest disruption was associated with the arrival at the power station of water laden with mud, plant debris and sediment after the dam had been opened by gradual erosion/incision of the displaced mass on the night of February 23 to 24, 2024. The large-scale arrival of this water is evidence of a more significant phase of incision, followed by other, less significant phases in terms of material eroded (erosion rate). This prompted the power plant's technicians to shut down the plant and evacuate the incoming water, which posed a real threat to the plant. On the evening of February 24, 2024, erosion of the displaced mass continued, but at a more moderate rate.

The fact that the dam created by the landslide was progressively eroded is further proof that the materials affected by the landslide were erodible and therefore susceptible to ground instability. However, the damage caused by this dam failure would be greater if the failure were abrupt. This would cause major damage to the Ruzizi II hydroelectric power station and to the Ruzizi plain from Kamanyola. Regular monitoring of unstable zones in the Ruzizi gorge would be useful to prevent such damage.



Figure 2: Flooding created by the dammed lake following landslide reactivation. (a) Flooded house (2.5439 South; 28.8736 East) upstream of the formed lake. (B and C) Flooded crops (2.5592 South; 28.8924 East) just at the point of dam lake formation.

4. PERCEPTION AND BEHAVIOR OF THE POPULATION

The population of the area affected by the floods was shocked and thought the phenomenon was metaphysical. However, part of the population felt that the flooded houses were close to the river and that it would be better for the administrative authorities to prohibit the construction of houses along the river and relocate those not yet directly affected.

A large number of the population had travelled from the DRC and Rwanda to the site of the landslide to observe the monster that had linked the DRC and Rwanda for a few hours. Some of the population even thought that this DRC-Rwanda junction would be a source of insecurity, given the current security situation between the two countries. Some of the people we met on the spot thought that this phenomenon would be a message of an opportunity for rapprochement between the two countries.

5. RECORDED DAMAGE

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With regard to the instability of existing buildings and the flooding caused by the dam lake, field data reveal the following:

- Around 100 households (houses) directly affected or destroyed;
- Around 700 people left homeless;
- Huge loss of household materials;
- 18 ha of fields flooded (loss of agricultural production);
- No loss of human life recorded

6. RECOMMENDATION

In view of the observations made at the disaster sites in Buhozi and the Ruzizi valley, I have found that there is an urgent need for priority action to be taken in order to spare the local population and surrounding area from any disasters that may occur in the future. I recommend the following:

- Provide humanitarian assistance in the form of essential materials and foodstuffs.
- Organize, in a coordinated and urgent manner, the relocation of the population from the area affected by the Luhore landslide to the Kamagema river. Part of the population has already taken the initiative to evacuate, but seems to have been left to its own devices. There is an urgent need to identify and prepare a relocation site outside the unstable zone, and to move the threatened population to this site. The area affected by the landslide must be formally forbidden to build new houses, even after a period of instability.
- Enforce and reinforce existing land-use planning regulations, particularly in areas near rivers and unstable zones.
- Intensify field campaigns with regular measurements (remote sensing by drone, extenso metric on cracks, etc.) to quantify the activity of the Luhore landslide in Buhozi.
- Regularly monitor the activity of the Ruzizi landslide near Lukula and the level of the dam lake. This dam lake poses a major risk when filled with water in the event of a new dam on the river, and may suddenly give way. The Ruzizi II hydroelectric power station and rural centers such as Kamanyola are under constant threat. With a lack of warning systems, this can cause a lot of damage downstream.
- Strengthen reforestation activities in these problem areas (trees on these sites could improve vegetation cover and strengthen soil structure).
- Collaborate with neighboring countries with which our country shares the operation of the Ruzizi II power plant to find suitable mechanisms for better monitoring of the active landslide and its dam lake; or even better monitoring of active landslides in the Ruzizi gorge.

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Annex some other images on the site

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Here's me in person, young evaluator

