HARISSA: Natural HAzards, RISks and Society in Africa: developing knowledge and capacities

Nyiragongo territory and the north of the city of Goma devastated by the lava flow due to the eruption of the Nyiragongo volcano which occurred on the 22nd May 2021 (photo taken during a helicopter flight on 5 June 2021 ; © RMCA, 2021)

Dear reader,

The events of the last few months are a good reminder of how significant the impact of natural disasters can be on people and infrastructure. Whether it is the flooding that the coastal areas of Lake Tanganyika have experienced, the meteorological phenomena that affect crops, or the eruption of the Nyiragongo volcano that devastated an urban area, these events have serious short- and long-term repercussions on the development of the entire region. Understanding these disasters by attempting to understand their mechanisms and their distribution in time and space is one of the major objectives of the HARISSA project. The activities carried out by the project's partner institutions contribute to this objective, through doctoral research, the collection of basic data essential to this research, awareness-raising and training at master's level, the maintenance and capitalisation of previous scientific achievements, and the mapping of territories or elements exposed to risks.

The scale of the task is great and HARISSA's contribution is certainly modest, but what characterises most of the teams, which have a total of more than 50 participants, is their motivation and involvement. Scientific knowledge and expertise are useless if they do not contribute to a better future.

Dr. François Kervyn
Coordinator of the HARISSA project

CURRENT ACTIVITIES

The ***Centre de Recherche en Sciences Naturelles de Lwiro***, through its Geophysics and Environment departments, is involved in the HARISSA project through 3 main tasks:

- **Two Master's scholarships were awarded to Théophile Tambala and Théophile Mana**, researchers in the Geophysics and Environment departments respectively: Since March 2021, they have been following courses in the Master's programme in environment and natural resource management at the *Université officielle de Bukavu* (UOB).
- **Maintenance and data collection of seismological and rainfall measurement stations**: This maintenance and data collection are ongoing activities. For the stations of the KivuSnet and KivuGnet networks, they are carried out by the Geophysics department, which ensures that there is no malfunction. As for the 12 rainfall stations spread along the west coast of lakes Kivu and

Tanganyika (DRC), from Matanda in the north to Uvira in the south, they provide unique data for the region, which is used in ongoing research carried out by CRSN researchers.

- **Supervision of a network of 20 citizen observers (COs)**: this network, supervised by Théo Mana of the Environment Department, is made up of Civil Protection agents. They collect data on disasters associated with natural hazards (floods, storms, earthquakes, landslides, lightning), which occur in North and South Kivu provinces. In the first quarter of 2021, 34 events, mainly floods, were reported. The rise in Lake Tanganyika caused significant direct damage to infrastructure in Uvira, as well as health risks (pollution, waterborne diseases and malaria). The second quarter of 2021 was marked by the Nyiragongo volcanic eruption on the 22nd May and the Kamituga earthquake on the 10th June, which caused significant direct damage. COs and GeoRiskA partners collected information on the ground. **This activity is carried out in collaboration with the Civil Protection of North and South Kivu**.



Figures 1 to 3 : The rising waters of Lake Tanganyika in Uvira since January 2021 continue to affect the city today (© CRSN/RMCA, 2021).

INSTITUT GEOGRAPHIQUE DU CONGO

L'Institut Géographique du Congo Nord-Kivu **(IGC-NK)** continued to benefit from technical and scientific support from the RMCA in the implementation of three activities :

- **Strengthening the Geographic Information System skills** of the teams in Goma, Bukavu and Kindu, through online work sessions given by an RMCA expert.

- **Development of mapping applications** to meet the priorities of the IGC: among the results already achieved, we note (1) the updating of the map of the city of Goma at the scale of neighborhoods and (2) the production of administrative maps of the external boundaries of the provinces of North Kivu, South Kivu and Maniema.

- **Survey on the impact on infrastructures of the earthquakes that occurred in Goma following the eruption of the Nyiragongo volcano on 22 May 2021**: Following a request from the Civil Protection of North Kivu, the IGC-Goma, helped by students from La Sapientia University, carried out a survey to identify the damaged infrastructures. This survey was carried out in collaboration with and under the supervision of the RMCA and the IGC-NK. After designing the survey form, teams were formed and information was collected from local authorities (district chiefs, avenue chiefs) and the population from 2 to 9 June. The data on 1,338 damaged infrastructures were processed in a GIS (see Fig. 4). The results of the survey were presented to the North Kivu crisis management unit on 14 June 2021.

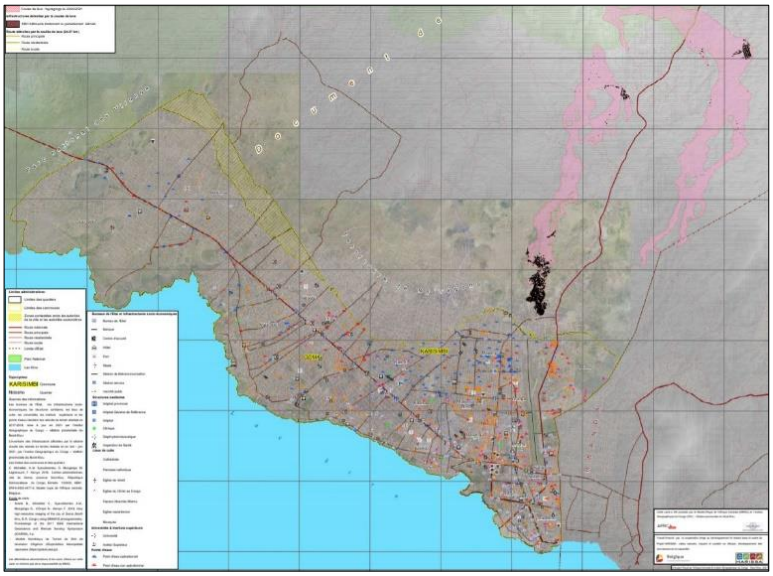

Figure 4 : First version of the map showing the lava flow of 22 May and the infrastructures damaged by the earthquakes following the eruption of the Nyiragongo volcano (© IGC/MRAC, 2021)

Data collection by the **network of [15 citizen observers]** went smoothly between February and April under the supervision of David Mubiru of ***Mbarara University (MUST)***. This network, which is operational in the districts of Kabale, Kisoro and Rubanda in Uganda, collects the same information as the one managed by the CRSN. It should be noted that between May and July 2021, due to the national containment imposed to combat the spread of COVID-19, the movement of COs was reduced and there was little reporting during this period.

Recent natural disasters have included a hailstorm in the Rubanda district (Fig. 5).

Figure 5: A tobacco plantation devastated by a hailstorm on 17/02/2021 in Nyamweru County, Kyokyezo Parish (© MUST/RMCA, 2021).

The ***Goma Volcano Observatory*** **(GVO)** was heavily solicited by the provincial and national authorities during the eruption of the Nyiragongo volcano on the 22nd May 2021, as well as in the weeks that followed this event. Since then, all activities undertaken by the GVO in the framework of the HARISSA project have been put on hold.

The ***Civil Protection of North Kivu (PC-NK)*** was focused on managing the response to the 22nd May eruption of the Nyiragongo volcano. It played a crucial role in the evacuation and repatriation of the population of Goma between 22 May and 7 June, as well as in the coordination of humanitarian assistance (Fig. 6). At his request, a survey on the impact of the lava flow was carried out from 1 to 13 June, in collaboration with the RMCA and the National Institute of Statistics of North Kivu (Fig. 7). The results of this survey made it possible to determine the number of households made homeless by the eruption and to identify them. Several Kivu COs were part of the surveyors group. The rapid implementation of this survey was possible thanks to the COs' knowledge of the KoboCollect app. To date, PC-NK continues to monitor the response to those directly affected by the eruption. Disaster prevention via the HAZAGORA tool is currently on hold.

Figure 6 : Disaster-affected people grouped in front of EP Kayembe (Nyiragongo territory), waiting for registration (5 June 2021 © RMCA)

Figure 7 : Two surveyors interviewing disaster victims (9 June 2021 © MRAC)

L'Université du Burundi (UB) and ***l'Université Officielle de Bukavu*** **(UOB)** are involved in the establishment of an **inter-university master's programme on risks related to natural hazards**. Discussions for the establishment of this programme are ongoing. However, they have been slowed down both by health constraints linked to COVID, which prevented the UOB representative from travelling to Bujumbura to meet his UB counterpart, and by the eruption of the Nyiragongo volcano, which took up the time of the RMCA-GeoRiskA team. The launch of this programme is still scheduled for the end of 2021.

Researchers from the Department of Geology of ***Université Officielle de Bukavu*** (UOB) are also involved in the maintenance and data collection of the rainfall station, as well as the observation of the Ikoma landslide, located about 15 km west of Bukavu city (Fig. 8).

Figure 8 : The Ikoma landslide, South Kivu province (DRC) on 30/01/2021 (© T. Mugaruka Bibentyo, UOB)

The development of the **Centre d'Information sur les Risques Naturels (CIRiNa)** has been slowed down in recent months by the eruption of the Nyiragongo volcano, which has kept the RMCA-GeoRiskA team busy. Although the future exhibition and animation room for CIRiNa activities is ready, some posters have not yet been finalised. The opening of the CIRiNa is still planned for the end of 2021.

RECENT ACTIVITIES OF HARISSA PhD STUDENT

Blaise Mafuko (MRAC/VUB/UNIGOM) : The main activity during my stay in Belgium (February to July) was the analysis of the survey on population preparedness and perception of volcanic risk in Goma. I also followed the Nyiragongo volcano crisis from a distance and contributed to the mapping of fissures in Goma.

Violet Kanyiginya Twagira (MRAC/VUB/MUST) : My time at the RMCA allowed me to make progress in the analysis of natural hazard data in the Kigezi Highlands region. In particular, I was able to work on the visual interpretation of historical aerial photographs obtained from the Ugandan government, using a stereoscope, and to analyse the changing landscape.

Toussaint Mugaruka Bibentyo (MRAC/UGent/UOB) : Field work to collect undisturbed soil samples was carried out in February 2021 in the Ruzizi River gorge. I was able to analyse these samples in the laboratory at Ghent University between April and June to understand the role of soil mechanical properties in landslide dynamics.

Jean Nsabimana (MRAC/UNamur/UB) : During my stay in Belgium, I participated in a communication workshop organised by UNamur and I presented my thesis in 180 seconds (MT180). I also worked on the processing and analysis of the data collected between October 2020 and January 2021. In particular, I produced a map of past catastrophic events for the assessment of the exposure of the city of Bujumbura to hydrological hazards based on data collected from institutions (civil protection police, IOM, and OCHA-Burundi publications) and data collected in the field (quantitative survey and qualitative data from focus group discussions).

Missions and conferences (past and coming)

- *2021/03-06 : Several AfricaMuseum geo-webinars were organized during this period; do not hesitate to contact Caroline Michellier if you would like to make a presentation of your activities as soon as in September 2021 (caroline.michellier@africamuseum.be))*
- *2021/04/19-30 : vEGU 2021 : Annual conference in the field of earth sciences with 13,500 online participants this year. HARISSA PhD students actively participated. The abstracts of their papers are available on the conference website. Enter their name in the search box that appears on this page.*
- *2021/05: Several researchers of the GeoRiskA team went to Goma in order to contribute to the volcanic crisis management.*

- *2021/08 : PhD student Blaise Mafuko is participating in two FLAMES training courses (Qualitative Data Analysis with NVivo and Multilevel Analysis); PhD student Toussaint Mugaruka Bibentyo will also participate in a FLAMES training course next September (Methodology and Statistics).*
- *2021/08 : Installation by MUST of new rain gauges in identified catchments in the Kigezi highlands (Uganda).*
- *2021/09 : Organisation by MUST of a workshop with COs to share experiences and suggest a way forward based on the recent period of data collection and reporting (Uganda).*
- *2021/12 : PhD student Jean Nsabimana submitted an abstract on "Population perception of the causes of vulnerability to flooding in an African city: the case of Bujumbura" to the International Population Conference 2021 (https://ipc2021hyderabad.iussp.org/).*

Publications

- **Dille, A.**, **Kervyn, F.**, *Handwerger, A., d'Oreye, N., Derauw, D.,* **Mugaruka Bibentyo, T.**, *Samsonov, S., Malet, J-P, Kervyn, M.,* **Dewitte, O.**, *2021. When correlation is needed: unravelling the complex dynamics of a slow-moving landslide in the tropics with dense radar and optical time series. Remote Sensing of Environment 258, 112402. https://doi.org/10.1016/j.rse.2021.112402*
- **GeoRiskA website** *: updating the website of the GeoRiskA team of the Natural Hazards Department of the Royal Museum for Central Africa (https://georiska.africamuseum.be/). The HARISSA project is presented, as well as all partners, involved PhD students and citizen observers.*

Acknowledgements

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