SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Physical Geography

has the honor to invite you to the public defence of the PhD thesis of

John Sekajugo

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Quantitative vulnerability and risk assessment of geo-hydrological hazards in a data-scarce environment with a contribution of citizen science

Promotors:
Prof. dr. Matthieu Kervyn (VUB)
Assoc. prof. dr. Grace Kagoro-Rugunda (MUST)
Dr. Olivier Dewitte (RMCA)

The defence will take place on

Thursday, January 18, 2024 at 15h in I.0.03

The defence can also be followed through a live stream: Click here to join online

Members of the jury

Prof. dr. Frank Canters (VUB, chair)
Prof. dr. Benoît Smets (VUB, secretary)
Prof. dr. Tom Van Der Stocken (VUB)
Prof. dr. Cees van Westen (University of Twente, The Netherlands)
Prof. dr. Liesbet Vranken (KULeuven)

Curriculum vitae

John Sekajugo holds a MSc degree in Climate Change and Disaster Management, and a BSc in Natural Resource Economics, from Busitema University, Uganda. He has benefited from a VLIR-UOS PhD scholarship for his research in the department of Geography, VUB. He is a co-author of nine articles in international peer-revied journals, among which one in the framework of his PhD research. He frequently presented his work at different international conferences, and has supervised several students at bachelors and Masters level. His research interest is in climate change risk management.

Abstract of the PhD research

Landslides and floods are geo-hydrological hazards that are frequently associated with large socio-economic and environmental impacts. Understanding what controls the impact on exposed elements and analysing the risk at local to regional scales is a prerequisite for building resilient communities. Risk assessments require spatio-temporally explicit data on occurrence and impact of hazards. In many regions, such data is difficult to obtain by academic researchers due to limited financial resources for field work and the accessibility challenges of the affected areas.

The contribution of citizen scientists (local non-expert scientists) in risk assessment has gained global recognition. However, their real added value to risk analysis is not yet demonstrated. In this study, we conduct a regional-scale vulnerability and risk analysis in Uganda while evaluating the contribution of citizen science data, taking the case of the geo-observer network established in 2017 in the Southwestern (SW) part of the country. First, we evaluate the reliability of the citizen science-based hazard inventory by comparing it with satellite image-based inventories and an independent dataset established through fieldwork. The results show that citizen scientists precisely detect and report geo-hydrological hazards and their impact in near real time although at a risk of missing out almost 50% of the occurrences. Satellite image-based mapping results in spatially less-biased inventories; however, small landslides are often missed and shallow ones confused with freshly cleared vegetation.

Then we quantify the economic impact of landslides and floods on buildings and roads, determine the factors that control the level of impact and construct regional landslide and flood physical vulnerability functions for buildings by integrating fieldwork with statistical methods. We show that the impact of landslides and floods is unevenly spatially distributed and the extents of loss they cause also vary with exposed elements.

Finally, we use the citizen-science-based inventory to translate an existing regional landslide susceptibility into a hazard map. By combining the hazard results with vulnerability and value of exposed buildings, we produce the first quantitative landslide risk analysis at parish scale in SW Uganda and compare the estimated yearly loss at parish level with impact reported by citizen scientists. The study highlights the most at-risk administrative areas where the implementation of appropriate disaster risk reduction programs need to focus.