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## Accuracy and completeness of a near real-time citizen science-based multi-disaster inventory in the Rwenzori Mountains, Uganda

John Sekajugo<sup>1,2,3</sup>, Grace R Kagoro<sup>3</sup>, Liesbet Jacobs<sup>4</sup>, Clovis Kabaseke<sup>1</sup>, Esther Namara<sup>1</sup>, Olivier Dewitte<sup>5</sup>, and Matthieu Kervyn<sup>2</sup>

<sup>1</sup>School of Agriculture and Environmental Sciences, Mountains of the Moon University, Fort Portal, Uganda

<sup>2</sup>Department of Geography, Vrije Universiteit Brussels, Brussels, Belgium

<sup>3</sup>Department of Biology, Mbarara University of Science and Technology, Mbarara, Uganda

<sup>4</sup>Division of Geography and Tourism, Department of Earth and Environmental Sciences, KU Leuven, Belgium

<sup>5</sup>Department of Earth Sciences, Royal Museum for Central Africa, Tervuren, Belgium

Accurate and complete inventory of natural hazard occurrence and their level of impact is a key first step to risk assessment, but it remains a challenge, especially for high frequency low impact events that rarely makes it to the news media. This challenge is even greater in rural areas of developing countries such as Uganda, where limited IT facilities prevent dissemination of information through social media. Here we report on a citizen-science initiative to monitor small-scale disasters (landslides and floods) occurring in the Rwenzori Mountains. A network of citizen (geo-)observers was established in February 2017 to collect temporally explicit geo-referenced information on eight different hazards and their impact using smartphone technology. Since then, over 500 hazard occurrences have been reported. However, such dataset needs to be assessed for its accuracy and potential biases before being used for scientific analysis. In this study, we evaluate the accuracy and completeness of the geo-observer-based disaster reports. First, systematic errors are reduced by peer reviewing the reports and implementing automatic tests to assess potential errors in detection and biases. Then, we compare the geo-observer-based records with two independent inventories collected through systematic field mapping and satellite imagery mapping, focusing on landslide and flood events for the period between May 2019 and May 2020. Results show over 95% of the geo-observer reports validated in the field were correctly identified and recorded less than 5 days after the occurrence (60% true positives, 1% false positives and 39% false negatives). For the satellite imagery mapping, 29% were true positives, 43% false positives and 28% false negatives. Geo-observers provide near real time disaster information on the location and level of impact, something difficult to achieve with systematic field and satellite imagery mapping. Depending on the topography of the area and the weather conditions, it can take several days to weeks before a cloud-free satellite image of a place can be obtained. The false negatives in the Geo-observer data are due to the tendency to report mainly occurrences along roads and rural foot paths since such occurrences are easily seen and accessed. Isolated small and inaccessible landslides are often not seen or reported to the Geo-observers. While satellite imagery mapping provides an opportunity to record disaster occurrences even in extremely inaccessible places, small landslides are often missed while shallow ones can easily be confused

with freshly cleared vegetation for crop planting. Citizen science-based disaster reporting therefore not only provide the spatial occurrence of disasters but also the temporal and weather-related information, necessary for disaster risk analysis.