Improvement of national landslide inventory for Malawi: from visual remote sensing analyses to field evidences

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In the context of landslide risk reduction and management, landslide inventory maps provide the first information for assessing the susceptibility, hazard and risk of a given area. These inventories serve as a basis for the creation and the improvement of spatial and attribute databases, then, where appropriate, the use of more or less complex approaches to map susceptibility, hazards and risk.

Obtaining a comprehensive landslide inventory map for a large territory at national scale (i.e. 1:250,000 scale), is difficult. Throughout the world, only few examples exist of such inventories. For most countries, these inventories are mainly the result of the compilation of work carried out individually, by different organizations for different projects and at different scales. In many cases, the information collected is scattered and does not correspond to each other.

For some years, some automatic or semi-automatic methods based on the analysis of multi-temporal and multi-scale satellite images are available for extracting spatial and attribute information (landslide envelope, typology, morphometry, etc.). However, these methods are still exploratory, sometimes giving approximate and non-exhaustive results. Thus, in many cases, visual remote sensing analysis of phenomena (i.e. aerial photograph or satellite image interpretation) remains the commonly used means.

The landslide module of GEMMAP* consists in improving the landslide inventory maps for Malawi. The method is based on (1) analysis of available landslide inventories (spatial databases); (2) visual analysis of satellite images, in particular through images under Google Earth Pro®; (3) integration of spatial and attribute information identified in the second step; (4) field control of new information; (5) analysis of new information and integration in a new spatialized database.

The initial desktop study combines historical information with remote sensing analysis. Subsequent field control of the provisional landslide maps is essential for several reasons; (1) to define the types of phenomena; (2) to understand the relationships between different environmental factors and unstable phenomena; and (3) to take into account some changes due to anthropogenic factors in the context of susceptibility and hazard maps for these changing subtropical environments.

The different landslide databases and inventory maps provide will serve to establish hazard maps at 1:250,000 scale for different types of slope instability by the end of 2020.

* The "Geological Mapping and Mineral Assessment of Malawi" project (GEMMAP) is led by the BRGM, with international partners GTK (Geological Survey of Finland), and CGS (Geological Survey of South Africa). The client is the Government of Malawi through the Geological Survey Department (GSD).