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Landslide susceptibility assessment in the Pays d'Auge plateau (Normandy, France): application at different scales

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This research takes place in the hilly valleys of the Pays d'Auge where few scientific works have been conducted on landslide risk in spite of the activity of the processes. Moreover, the local authorities are still lacking operational mapping resources in order to improve the landuse planning and risk reduction. The susceptibility or hazard maps performed by statistical approaches can sometimes be difficult to understand by end-users. Therefore, they usually prefer to work with direct methods (i.e. expert mapping), even if they are often considered as subjective by scientists. Independently of the mapping method, it is difficult to obtain rapidly susceptibility maps on large areas that fit to the operational scale. These small scale maps are often not accepted by end-users, particularly because of the lack of accuracy of the available datasets.

Then, this presentation focus on the production of landslide susceptibility maps at different scales, using GIS as a first stage towards operational landslide hazard assessment. The main objective is to show the research process coupling the geomorphological approach and the statistical modelling. This study is splitted in three major steps: (1) a geomorphological approach at the landslide scale; (2) a landslide susceptibility mapping at regional scale; and finally (3) a landslide susceptibility mapping at detailed scale.

(1) Due to the lack of bibliographical and expert references on the existing landslides in this area, a first geomorphological study was conducted in order to build a landslide inventory with a detailed typology. Then, for each landslide type, the predisposing and triggering factors were defined. This first step is essential in order to supply the geomorphologist's expert opinion on this specific site.

(2) These observations on predisposing factors were formalized into a heuristic model (SMCE) in order to assess the regional landslide susceptibility at small scale i.e. 1/100.000. In this case, only simple and directly available dataset were introduced in the model (i.e. slope angle, geology and landuse). The objective of this second step was to produce simple and informative map that could help end-users and researchers to focus on priority sectors in the mapping of susceptibility/hazard at a bigger scale (advisory and statutory mapping).

(3) From this regional susceptibility map, two areas indicating a high susceptibility to landsliding were chosen as study test sites to produce new susceptibility maps at a bigger scale (i.e. 1/10.000 scale, as request the French legal procedure called - Plans de Prévention des Risques - PPR). For this step a multivariate statistical method, i.e. "logistic regression" was chosen. This step aimed to use the statistical approach as an alternative to the usual "expert based" approach often considered as subjective. A particular attention was taken to the quality of the input data in order to obtain good results that fit to the detailed scale.

Finally, because some questions arise from the results of the multivariate statistical approach (i.e uncertainty due to the lack of observation data) some methodological considerations were proposed to couple statistical and expert approaches.