



Analysis of national and regional landslide inventories in Europe

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A landslide inventory can be defined as a detailed register of the distribution and characteristics of past landslides in an area. Today most landslide inventories have the form of digital databases including landslide distribution maps and associated alphanumeric information for each landslide. While landslide inventories are of the utmost importance for land use planning and risk management through the generation of landslide zonation (susceptibility, hazard and risk) maps, landslide databases are thought to greatly differ from one country to another and often also within the same country. This hampers the generation of comparable, harmonised landslide zonation maps at national and continental scales, which is needed for policy and decision making at EU level as regarded for instance in the INSPIRE Directive and the Thematic Strategy for Soil Protection.

In order to have a clear understanding of the landslide inventories available in Europe and their potential to produce landslide zonation maps as well as to draw recommendations to improve harmonisation and interoperability between landslide databases, we have surveyed 37 countries. In total, information has been collected and analysed for 24 national databases in 22 countries (Albania, Andorra, Austria, Bosnia and Herzegovina, Bulgaria, Czech Republic, Former Yugoslav Republic of Macedonia, France, Greece, Hungary, Iceland, Ireland, Italy, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and UK) and 22 regional databases in 10 countries. At the moment, over 633,000 landslides are recorded in national databases, representing on average less than 50% of the estimated landslides occurred in these countries. The sample of regional databases included over 103,000 landslides, with an estimated completeness substantially higher than that of national databases, as more attention can be paid for data collection over smaller regions. Yet, both for national and regional coverage, the data collection methods only occasionally included advanced technologies such as remote sensing.

With regard to the inventory maps of most databases, the analysis illustrates the high variability of scales (between 1:10 000 and 1:1 M for national inventories, and from 1:10 000 to 1:25 000 for regional inventories), landslide classification systems and representation symbology. It also shows the difficulties to precisely locate landslides referred to in historical documents only. In addition, information on landslide magnitude, geometrical characteristics and age reported in national and regional databases greatly differs, even within the same database, as it strongly depends on the objectives of the database, the data collection methods used, the resources employed and the remaining landslide expression. In particular, landslide initiation and/or reactivation dates are generally estimated in less than 25% of records, thus making hazard and hence risk assessment difficult. In most databases, scarce information on landslide impact (damage and casualties) further hinders risk assessment at regional and national scales. Estimated landslide activity, which is very relevant to early warning and emergency management, is only included in half of the national databases and restricted to part of the landslides registered. Moreover, the availability of this information is not substantially higher in regional databases than in national ones. Most landslide databases further included information on geo-environmental characteristics at the landslide site, which is very important for modelling landslide zoning. Although a number of national and regional agencies provide free web-GIS visualisation services, the potential of existing landslide databases is often not fully exploited as, in many cases, access by the general public and external researchers is restricted. Additionally, the availability of information only in the national or local language is common to most national and regional databases, thus hampering consultation for most foreigners.

Finally, some suggestions for a minimum set of attributes to be collected and made available by European countries for building up a continental landslide database in support of EU policies are presented. This study has been conducted in the framework of the EU-FP7 project SafeLand (Grant Agreement 22647).