5th Italian Workshop on Landslides (IWL 2018)
28 - 30 May 2018, Napoli, Italy

OPEN CHALLENGES FOR OPERATIONAL FORECASTING AND EARLY WARNING OF RAINFALL INDUCED LANDSLIDES

FAUSTO GUZZETTI[1]

[1]*Consiglio Nazionale delle Ricerche, Istituto di Ricerca per la Protezione Idrogeologica, Perugia, Italy.*
E-mail: fausto.guzzetti@irpi.cnr.it

Nothing that we know today on rainfall and landslides prevent us to forecast rainfall-induced landslides. Despite, our collective ability to predict (or forecast) rainfall-induced landslides remains limited. Rainfall-induced landslides occur every year claiming lives and producing severe economic and environmental damage. Thus, in many regions – including Italy – the timely and accurate forecast of rainfall-induced landslides is of both scientific interest and social relevance.

Throughout the world, there is a mounting interest for the operational forecasting of rainfall-induced landslides, and for early warning systems capable of anticipating the occurrence of rainfall-induced landslides. Inspection of the literature reveals that common criteria and standards for the design, the implementation, the operation, and the evaluation of the performances of the systems, are lacking. This limits the possibility to compare and to evaluate the systems critically, to identify their strengths and weaknesses and to improve their performance.

Following a brief introduction on the meaning, scope and inherent difficulty of predicting natural hazards – including landslides – the contribution focuses on regional to national-scale landslide forecasting systems, and specifically on operational systems based on empirical rainfall thresholds. Building on the experience gained operating landslide forecasting systems in Italy, the contribution discusses concepts, limitations and challenges inherent to the design of reliable forecasting and early warning systems for rainfall-induced landslides, the evaluation of the performances of the systems, and on problems related to the use of the forecasts and the issuing of landslide warnings. Various elements of an operational landslide forecasting system are considered, including: (a) the rainfall and landslide information used to establish the thresholds, (b) the methods and tools used to define the thresholds and their uncertainty, (c) the quality and quantity of the rainfall information used for operational forecasting, (d) the ancillary information used to prepare the forecasts, including terrain subdivisions and landslide susceptibility / hazard maps, (e) the criteria used to use the forecasts for issuing landslide warnings, and the methods used to communicate the warnings, and (f) the strategies adopted to evaluate the performances of the systems. The contribution then focuses on open issues for the successful implementation and operation of landslide early warning systems.

The lessons learnt in Italy suggest that operational landslide forecasting of rainfall-induced landslides is feasible, and can possibly contribute to mitigate landslide risk, reducing fatalities. However, operational forecasting of rainfall-landslides remains a difficult and uncertain task. Many questions remain; which means a lot of work ahead of us.