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Landslides monitoring techniques review in the Geological Surveys of Europe

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Landsliding is the downslope movement of surface material under the force of gravity, initiated when gravitational and other types of shear stresses within the slope exceed the shear strength of the material that forms the slope. Often, landslides pose a physical and environmental threat to communities living in landslide-prone areas. While much landslide research focuses on monitoring techniques to define the background of the landslide (extent, volume, velocity, magnitude) one of the main goals of the Geological Surveys (GS) are to support and understand the regional and local geology to identify areas susceptible to landslides. With this perspective, a questionnaire on landslides monitoring techniques was distributed among GS of Europe to define which techniques are most widly used at GS and to distinguish those that can be considered as powerful tool for landslide mapping, monitoring, hazard analysis, and early warning, according to the type of geological settings. The initial results of the questionnaire showed that the most commonly used

monitoring techniques are geotehnical and mapping, followed by remote sensing and hydrological techniques. Among the 849,543 landslide records evidenced by the Geological Surveys of Europe in the paper of Herrera et al. (2017), we found only 47 landslides that have been monitored. However, only landslides that directly threatning the population and infrastructure or landslides with a volume greater than 10,000 m^3 have been monitored. Compared to other research (Hague et al., 2016; Froude and Petley, 2018) the questionnaire showed that the fundamental basis for any geologically-related study is geological field mapping. The results of this traditional method are commonly compiled and interpreted together with boreholes, other advanced geodetic (UAV photogrammetry, TLS, GNSS, GBInSAR), and geophysical techniques (electrical resistivity, seismic refraction, GPR). One of the critical survey findings shows on starting landslide monitoring after the failure, only 3% of observed landslides have been monitored before the occurrence. Considering these results, we evaluate the landslide-monitoring techniques and reveal different monitoring strategies between the GS of Europe.

Froude, M.J. and Petley, D. (2018) Global fatal landslide occurrence from 2004 to 2016. Natural Hazards and Earth System Sciences, 18. pp. 2161-2181

Haque U, Blum P, da Silva PF, Andersen P, Pilz J, Chalov SR, Malet J-P, Auflič MJ, Andres N, Poyiadji E, Lamas PC, Zhang W, Peshevski I, Pétursson HG, Kurt T, Dobrev N, García-Davalillo JC, Halkia M, Ferri S, Gaprindashvili G, Engström J, Keellings D (2016) Fatal landslides in Europe. Landslides 13:1–10

Herrera, G., Mateos, R. M., García-Davalillo, J. C., Grandjean, G., Poyiadji, E., Maftei, R., Filipciuc, T.C., Jemec Auflič, M., Jež, J., Podolszki, L., Trigila, A., Iadanza, C., Raetzo, H., Kociu, A., Przyłucka, M., 446 Kułak, M., Sheehy, M., Pellicer, X. M., McKeown, C., Ryan, G., Kopačková, V., Frei, M., Kuhn, D., 447 Hermanns, R. L., Koulermou, N., Smith, C. A., Engdahl, M., Buxó, P., Gonzalez, M., Dashwood, C., 448 Reeves, H., Cigna, F., Liščák, P., Pauditš, P., Mikulėnas, V., Demir, V., Raha, M., Quental, L., Sandić, C., and Jensen, O. A. (2018) Landslide databases in the Geological Surveys of Europe, Landslides, 15, 450: 359-379.