EGU23-15170, updated on 30 Nov 2023
https://doi.org/10.5194/egusphere-egu23-15170
EGU General Assembly 2023
© Author(s) 2023. This work is distributed under
the Creative Commons Attribution 4.0 License.

Low-cost Hydrological Monitoring System For Assessing Shallow Landslide Occurrence Along Linear Infrastructures

Margherita Pavanello[1], Massimiliano Bordoni[1], Valerio Vivaldi[1], Mauro Reguzzoni[2], Andrea Tamburini[3], Fabio Villa[3], and Claudia Meisina[1]

[1]Department of Earth and Environmental Sciences, University of Pavia, Pavia, Italy
[2]Hortus Srl (Monitoring Solutions & Software Application), Legnano, Italy
[3]Imageo Srl, Milano, Italy

Abstract

Shallow landslides induced by heavy rainfall are a worldwide widespread phenomena and their related hazard is expected to increase due to more intense rainfall as a consequence of climate change (EEA Report No 15/2017). Since 2017, a decision-making tool based on Multi-Criteria Analysis (MCA) has been proposed as an objective approach to obtain landslide susceptibility maps and plan proper remedial works along linear infrastructure corridors (Tamburini et al., 2017). The study of low-cost sensors for Landslides Early Warning Systems (LEWS) as a risk mitigation tool to these phenomena along highways, railways and pipelines is here presented.

Soil hydrological conditions before a rainfall event for the estimation of trigger moments (Bordoni et al., 2019) are the starting point of a LEWS. Different sensors for the measure of these parameters, particularly soil volumetric water content, exist with different pros and cons. The aim of the research is to compare seven low-cost sensors selected by *IMAGEO Srl* company together with *HORTUS Srl*. The sensors have been engineered with a datalogging system and an automatic in-cloud transmission of the data and in June 2022 have been located on field at 2 different depths (-0.6 m and -1.2 m) at the test-site of Montuè in the Northern Apennines (Italy) where an Hydrometeorological Monitoring Station (*Andromeda Project*) is operating since 2012 with high-cost TDR probes present at the same depths. In November 2022 a volumetric water content profiler with nine measurement depths up to 1 m deep has been added to the new monitoring system.

The comparison between the hydrological data acquired by different sensors allows to evaluate the quality and reliability of the low-cost system before its final installation along the infrastructures lines. Monitored data together with rainfall parameters provided by both in situ rain gauges and ERA5-LAND satellite-derived data are used as input for the reconstruction of soil

moisture values physically based thresholds.

The near real-time access to the monitored data allows to send warning alert when the established thresholds are exceeded, resulting in a LEWS able to identify periods of imminent landslide danger and to assess security along the lines.