

CIVIL DEFENSE OF MOLISE - ITALY

A monitoring and early warning system for the landslide in Civitacampomarano (Campobasso)



After the **huge landslide** occurred in the Municipality of Civitacampomarano, an **automatic monitoring and early warning system in real time** has been implemented and tested, aiming at guaranteeing public safety and managing the emergency situation.

The system allows to **automatically and uninterruptedly monitor the area**, in order to create a large database that, after an appropriate data processing and correlation. The **CAE multi-risk station (Mhaster)**, that depends on the system, is installed in the imposing Angionino Castle that overlooks the town threatened by the landslide.



Summary

Location: Civitacampomarano (CB), Italy

Conclusion: 2017

Focus: Geological and hydrogeological risk

Challenges:

- Guarantee public safety and manage the emergency of landslide

CAE solutions:

- Multi-risk station Mhaster
- Air thermometer, rain gauge, crack width gauges, surface clinometers, piezometric devices and manual inclinometers
- Self-reconfigurable Wireless Mesh Network (WSN) W-Master and W-Point
- GPRS/UMTS module and an UHF band radio device
- Data available at the Municipal Operative Centre, at the Functional Centre of the Civil Protection and also on a WEB platform

FEATURES

The system allows the municipal technicians and the regional staff to:

- **Evaluate** the behaviour of the monitored area during and after significant meteorological events;
- **Obtain** the necessary knowledge in order to manage any future emergency;
- **Plan and examine** any possible strengthening interventions that might become necessary, and test their effectiveness.



Apart from the monitoring data collection, the system also performs many **alert functions**, that are essential when a landslide occurs in inhabited areas like this. Particularly, 3 automatic scenarios can be defined: **normality, pre-alarm and alarm**.

The activation of these scenarios is functional to the rainfalls level and the landslide movements, measured by the movement of the sensors, whose alert threshold can be set on a different level for each network sensor. When an **intense rainfall phenomenon** occurs, the **pre-alarm** scenario is activated and the number of measurements for the data acquisition automatically increases.

Moreover, when at least 1 sensor indicates some sort of stress (inclination/opening) that exceeds the alert threshold, the alarm setting is activated and notifications are sent via **SMS/vocal message/Fax/Mail** to the staff. The client is free to set the system so that these notifications are sent even when a **pre-alarm scenario** is activated.

COMPOSITION

The station is equipped with an **air thermometer** and a **rain gauge** to examine the evolution of the instability to the rainfalls on the spot, as the main priming phenomenon of the instability. Moreover, the station collects the data registered by all the geotechnical equipment, which consists of **crack width gauges, surface clinometers, piezometric devices and manual inclinometers**.

The sensors installed near the red zone, which has been evacuated, communicate with the station through a **Self-reconfigurable Wireless Mesh Network**, that makes the system highly adaptable and allows us to easily and quickly modify the position of the sensors in order to adapt it to the changes occurring on the landslide.

The data are transmitted through a **duplex communication system** consisting of a **GPRS/UMTS** module and an **UHF band radio** device; in the remote measuring radio network of the Civil Protection System. Apart from for data acquisition and visualisation in the Operative centres, the data are also available on a **WEB platform** accessible through an internet browser.

As any other CAE device, the system works H24 in any sort of environmental operating conditions, thanks to:

- its **automatic diagnostic functionalities**, that allow us to check on its operating status remotely and in real time;
- its **energy independence**, thanks to the use of solar panels and batteries.

