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Reducing the vulnerability of communities to Glacial Lake Outburst Flood (GLOF) in Pakistan

Reducing the vulnerability of communities to Glacial Lake Outburst Flood (GLOF) in Pakistan

The **Hindukush-Karakorum-Himalayas** (HKH) hosts large repository of snow and glaciated ice, within which the presence of **glaciers** is complemented with the presence of **glacial** and **para-glacial lakes**. These lakes are formed due to climatic and geomorphological changes, for example:

- accelerated retreat of glaciers due to increases in temperatures;
- blockage of river channels due to landslides, glacier surges, and debris flows.

If breached, these lakes can trigger a **Glacial Lake Outburst Flood (GLOF)** and pose a direct threat to downstream communities.

Following an international competitive tendering process, CAE was awarded the contract for the supply to the **Pakistan Meteorological Department** (PMD) of **hydro-meteorological, communications** and related **IT equipment** for the establishment of a **GLOF EWS** in 24 valleys in the **Gilgit-Baltistan** and **Khyber-Pakhtunkhwa** regions.

The project, titled **"Scaling-Up of GLOF Risk Reduction in Northern Pakistan"** (**GLOFII**), was initiated to reduce the vulnerability of communities to GLOF hazards. Will be supplied a total of:

- **244 hydro-meteorological monitoring stations;**
- **54 warning posts;**
- **1 main national center;**
- **2 secondary centers.**

All the monitoring sites will be equipped with **CAE Tech Compact line dataloggers**, most of them located in remote areas, where the communications infrastructure can be less reliable, and for this reason equipped with both **mobile** and **satellite transmitter**.

The system will be configured to issue **alerts via SMS, email, messaging app** and **trigger the warning sirens** when predefined thresholds are exceeded.

CAE's high quality technologies, thanks to the support of local partners, such as the EV-K2-C-

NR, in charge of on-site activities and training, will enable the Pakistan Meteorological Department (PMD) to take concrete, coordinated actions that mitigate the effects of weather events. As the day-to-day impacts of **climate change** and **extreme weather events** continue to grow, the need for this type of projects will grow and CAE is and will always be ready to face these new challenges alongside customers. ■

Scaling-up of Glacial Lake Outburst Flood (GLOF) Risk Reduction in Northern Pakistan



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Warning and technological innovation: the Sentry software

CAE has just completed the development of a new application that allows you to define alarm thresholds, even on multiple parameters and with complex algorithms, as well as to spread alarm messages through several communication media. This software is equipped with a log system that allows you to track its own functioning and the events, as well as to forward the alarm notification and much more. We interviewed the Technical Director of CAE, Lorenzo Giandomenico, to ask him for some preview information on this new **CAE warning software: Sentry**.

What does Sentry do and why can we call it an innovative product?

Sentry is CAE new software for the spreading of warning messages. It is a **web-based software** that can be used "on-the-go" through the most common browsers, according to the needs of the market which requires greater and greater speed and flexibility.

We can define it as an innovative product also thanks to its **modular structure** that allows us to **easily add all kinds of means of communication for alert spreading**, including the increasingly used **messaging applications**, depending on the customer's needs.

Furthermore, like all CAE innovations, it cannot fail to pursue **maximum interoperability**.

What is the maximum interoperability for this software?

It consists of several aspects, as Sentry is a **cross-platform** software, which therefore works on different operating systems; moreover, it is **data-**



LORENZO GIANDOMENICO
Technical Director

base independent thanks to the **ORM technology**, but above all it interfaces with standard systems through the **CAP Protocol (Common Alerting Protocol)**.

This protocol is a standard that the whole world uses for **alert spreading** and it allows Sentry to be powered, that is, to be able to **issue alerts arriving from non-CAE systems that communicate through the aforementioned standard CAP protocol**. Sentry is therefore a very flexible product and can be used extremely easily even in non-CAE networks. ■

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Monitoring stations in the "Massif of the Central Apennines" increased in number

Following the seismic events of 2017, the District Basin Authority of the Central Apennines (**ABDAC**) has intensified its collaboration with the Regions affected by the earthquake, making its technical-scientific skills available to the Commission for reconstruction and providing an updated picture of the hydrogeological risk of the area in order to carry out a reconstruction in safe conditions. In order to further strengthen this collaboration, the **ReSTART Project** "Territorial Resilience of the Central Apennines - Post-Earthquake Reconstruction" was launched in the autumn of 2018, funded by the Agency for territorial cohesion through funds from the PON (National Operational Programme) for *Governance and institutional capacity 2014-2020*. The Project will last until June 2022, putting in place multiple

"actions and technologies for hydrogeological and anti-seismic prevention and planning."

The project focuses on 3 objectives:

1. technical support for post-earthquake reconstruction in conditions of hydrogeological safety as far as previous phenomena and induced earthquakes are concerned (**LANDSLIDES and FLOODS**);
2. reprogramming of water resources due to earthquake-induced effects (**WATER RESOURCE**);
3. pilot model of governance, as well as constant and continuous updating of the cognitive framework of risk phenomena (**URBAN PLANNING and GOVERNANCE MODEL**).

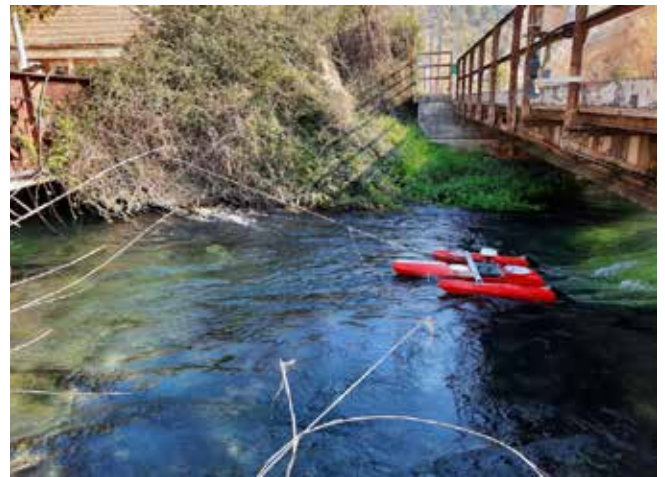
Thanks to this second objective, it will be possible to **increase the hydro-meteorological databa-**





se currently existing in the area of the so-called “Massif of the Central Apennines”, in the Regions of **Abruzzo, Lazio, Marche** and **Umbria**, in order to improve knowledge and assessment of the impact of seismic phenomena on the **water bodies of the water recharge area**.

Being the group leader in the RTI (Temporary grouping of companies) that won the contract, **CAE** has contributed to achieve this second objective: in fact, the works for the **supply and installation**





of automatic remote measurement stations for hydrometric, nivometric and pluviometric monitoring have almost been completed, resulting in the implementation in the hydro-pluviometric weather networks of the Regions of Lazio, Umbria, Marche and Abruzzo. Going into more detail, the project involves the supply and installation of **15 monitoring stations**, as well as **flow measurement** and **maintenance** activities for 12 months on the stations installed. Subsequently, these stations will fall under the **responsibility of their relevant Regions, whose networks have already been increased.**

The sensors used are equipped with analogue or serial outputs with Modbus or SDI12 protocols, which therefore are open and documented. All **sensors** therefore guarantee full **interoperability**, allowing interfacing and data acquisition with any other dataloggers which may need to be integrated, other than those provided.

Communication takes place via a 4G modem with **standard communication protocols**, which is suitable for integration on all the different networks involved and guarantees high data transmission speeds.



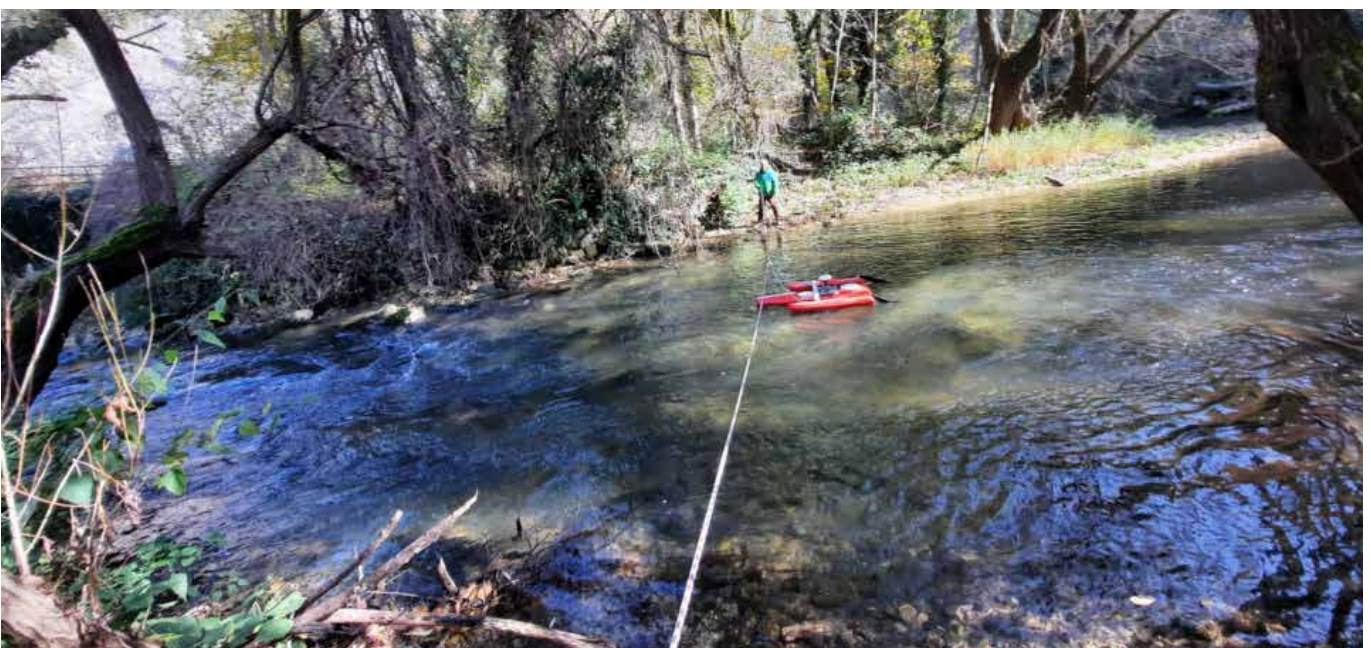
The technologies provided by CAE include:

- CompactPlus datalogger;
- THS thermo-hygrometer;
- PG10 rain gauges.

We are proud to have contributed to the **ReSTART**

project which intends to create a **model of “resilience”** that, despite being born specifically for the area of Central Italy, presents characteristics and purposes that make it **exportable** to any territory affected by natural disasters (both in Italy and worldwide). ■





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Early warning system for underpasses in the Municipality of Battipaglia

A **monitoring and early warning system** is being installed for a new **railway underpass** in the Municipality of **Battipaglia**, which will be useful for **inhibiting circulation** in case of **flooding**; this is a situation that could occur during **extreme flood events** that are more and more frequent. On behalf of GBL Costruzioni SUD srl, CAE is installing the system which consists of:

- a **hydrometric station**, for monitoring the level on the Tusciano river;
- a **control station**, located near the **underpass**, for detecting the **water level** in the underpass and activating **traffic lights, sirens and barriers**;
- a data acquisition and management **control centre**, located in the Municipality of Battipaglia.

The station installed on the bridge in Via del Centenario will constantly detect the **hydrometric level of the Tusciano river** and, in addition to sending the data to the municipal control centre, upon excee-



ding default critical thresholds, it will transmit these measurements to the control station located near the underpass.

The station will be connected to **3 piezometric sensors** installed in the lowest point of the underpass and at the drafting pit of the pumps dedicated to draining excess water; these sensors are necessary to detect the water level in the two spots and



thus to be able to issue alerts when default critical thresholds are exceeded. Therefore, this **station** will **take care of activating traffic lights and sirens** connected to it on the basis of **alarm logics linked to the measurements observed both by the station on the Tusciano river and by the piezometric sensors directly connected to it.**

When the first threshold exceeding is communicated, the system will turn on **a fixed yellow light** on the 2 traffic lights at the entrances of the underpass. When the second critical threshold is exceeded, the **red lights** and the 2 associated **sirens** will be activated, to produce an additional sound alert, as well as visual, and subsequently, when the acoustic signal continues for 5 minutes and after appropriate evacuation of the underpass, the **mobile barriers** will be activated to block circulation.

In addition to the aforementioned **local alert** functions that lead to traffic inhibition, the field stations will send **alert text messages** directly to the technicians in charge of handling the emergency, in order to promptly inform them of the course of the flood event. In addition, the stations, which will be equipped with both a main data communication module



via **UMTS/GPRS** and a secondary backup module via **satellite**, will also send the measurements observed to the acquisition centre located in the Municipality of Battipaglia, equipped with a **workstation operating CAE programs for data acquisition and visualization.** ■



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The WMO recognizes 3 “centennial observing stations” in Abruzzo Region



The weather stations of Campotosto, Chieti and Sulmona, belonging to the remote measurement network of the Civil Protection of Abruzzo Region, have been recognized as “**WMO centennial observing stations**”; this is a great achievement to which we are proud to have contributed, starting from 1998, with our CAE technology.

On July, 1st, 2021, this very important recognition was made official: the Executive Council of the WMO accepted the outcome of the evaluation performed by the Advisory Committee: among the 57 stations awarded in 2021 all over the world, 7 are Italian, of which 3 are located in Abruzzo. According to the requirements: the station must have been established at least 100 years ago; its downtime periods must not exceed 10%; the station must be operated according to the observation standards of the WMO; the observed and



measured data must be subject to quality control procedures according to current WMO guidelines and practices; historical observation data and metadata must be made available for scientific research and, last but not least, they must be digitally archived.


Long-term observing stations are part of the irreplaceable World Cultural and Scientific Heritage. They constitute unique sources of information on the past of atmospheric, climatic and environmental parameters, satisfying the need of current and future generations to collect high quality data in the long term, in order to have the necessary references for assessments on climate change.

"These long-term measurements... are the backbone of both weather forecasting and climate science. It is extremely important to ensure the long-term sustainability of these measurements", said



Prof. Petteri Taalas, Secretary-General of the World Meteorological Organization.

Congratulations to the Civil Protection of Abruzzo Region which in recent years has worked to maintain and guarantee the continuous functioning of these centennial stations. ■




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Centennial Observing Stations

"These long-term measurements ... are the backbone of both weather forecasting and climate science. It is highly important that we ensure the long-term sustainability of these measurements."

Prof. Petteri Taalas, Secretary-General, World Meteorological Organization

Long-term meteorological observations are part of the irreplaceable cultural and scientific heritage of mankind that serve the needs of current and future generations for long-term high quality climate records. They are unique sources of past information about atmospheric parameters, thus are references for climate variability and change assessments. To highlight this importance, WMO has a mechanism to recognize centennial observing stations. By so doing, the Organization promotes sustainable observational standards and best practices that facilitate the generation of high-quality time series data.

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