



EARLY WARNING SYSTEM FOR ROAD SLIP, ROCKFALL AND LANDSLIDES HELLOMAC

Date
Presenter

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HELLOMAC

MACCAFERRI



PHILIPPINE Red Cross-Davao de Oro rescuers arrive to rescue victims of a landslide in Maco, Davao de Oro, on Tuesday, February 6. (PRC-Davao de Oro)

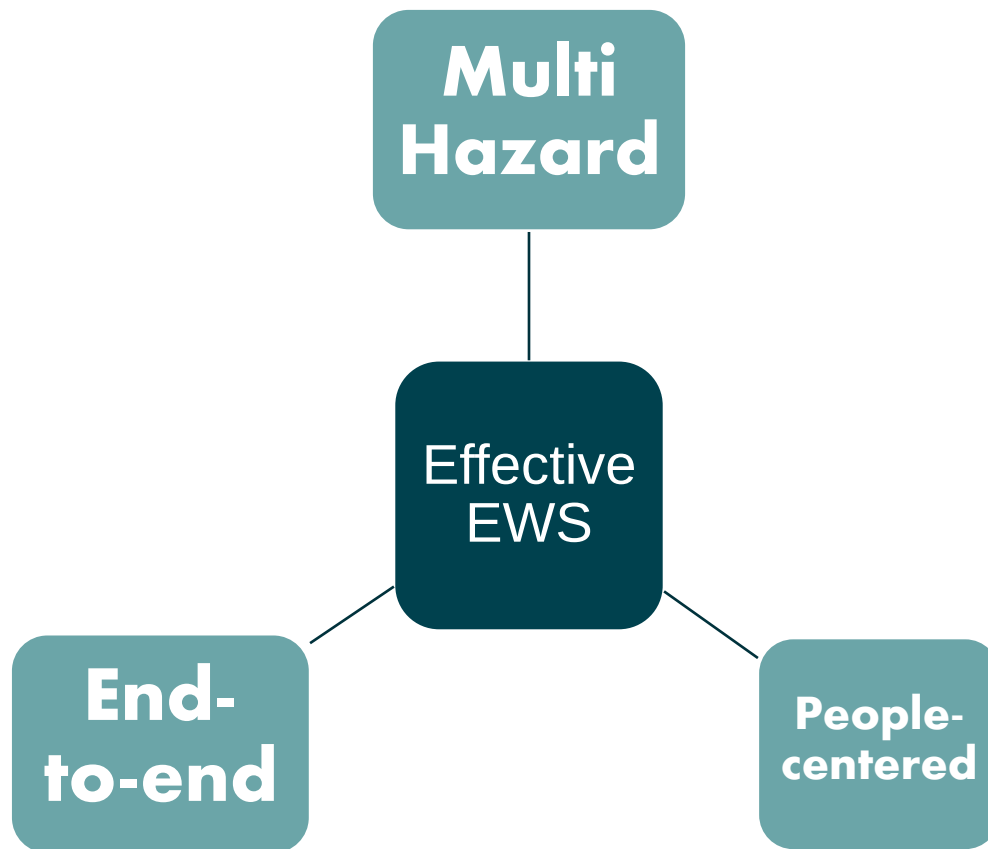


What is an Early Warning System?

“ Early Warning Systems represents the set of capacities needed to generate and disseminate warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

EWS are major component of disaster risk reduction. They prevent the loss of life, as well as reducing the economic impact of natural hazards.

”





**Why do you need
an early warning
system?**



Early warning saves lives.

Category of countries by coverage of MHEWS	Mortality per 100,000 population, 2005–2022 (SFM Indicator A-1)	Number of affected people per 100,000 population, 2005–2022 (SFM Indicator B-1)
Limited to moderate coverage (SFM Indicator G-1 score between 0 and 0.5)	4.05	3,132
Substantial to comprehensive coverage (SFM Indicator G-1 score between 0.5 and 1)	0.71	688

Source: SFM

Early warning saves lives.

Determine the type of slope failure.

Locate the monitoring points.

Decide on the threshold value.

WHAT IS MASS WASTING?

“Movement of rock or soil down slopes under the force of gravity”



Material



Movement



Structures

STRICTLY CONFIDENTIAL

TYPES OF LANDSLIDES

1.

ROTATIONAL LANDSLIDE

Ground rotates and slides along a curved failure plane.



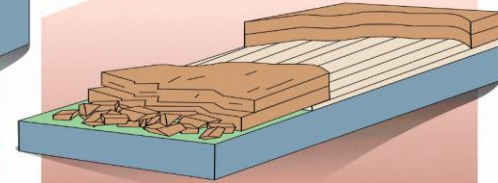
2.



TRANSLATIONAL LANDSLIDE

Ground slides with little rotation along a flat plane parallel to the surface.

3.



BLOCK SLIDE

A type of translational landslide made of mostly one block of surface material that moves downslope.

4.



ROCKFALL

Gravity sends rocks and other materials tumbling downslope.

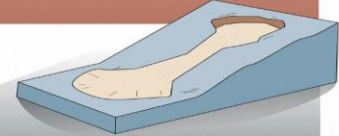
5.



TOPPLE

Pieces of a cliff or rock face fall forward as large blocks.

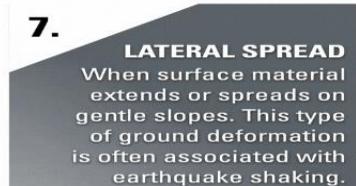
6.



EARTHFLOW

Form on moderate slopes when fine-grained material liquefies and runs out in hourglass shape.

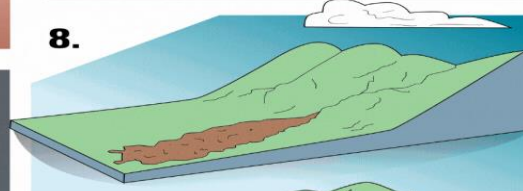
7.



LATERAL SPREAD

When surface material extends or spreads on gentle slopes. This type of ground deformation is often associated with earthquake shaking.

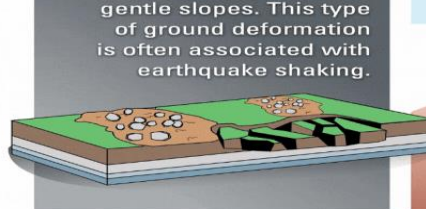
8.



DEBRIS FLOW

Rapidly moving mix of water, mud, trees, and other materials that flows downvalley and can travel great distances.

9.



DEBRIS AVALANCHE

An extremely large and fast moving debris flow.

10.

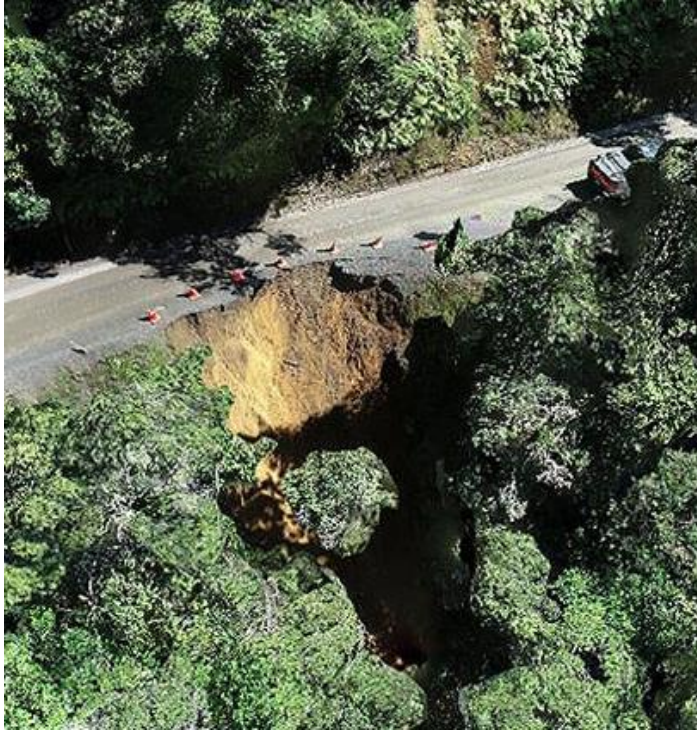


CREEP

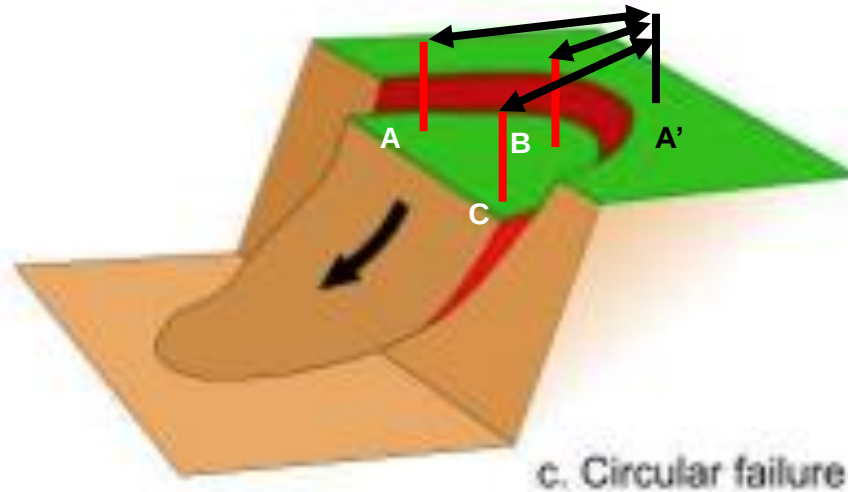
Soil and surface material that slowly moves down a slope.

Locate the Monitoring Points

Soil Mass



1. Locate the tension cracks
2. Identify points A, B and C traversing the tension cracks
3. Monitor displacements $A'-A$, $A'-B$ and $A'-C$.



Develop a slope failure model which considers:

- The slope geometry
- Creep characteristics
- Geomechanical quality of rocks/soils
- External loading
- Seismic and precipitation factors...etc.

The model shall dictate the trigger point for the early warning system.

Otherwise, use experience from previous landslide in the area

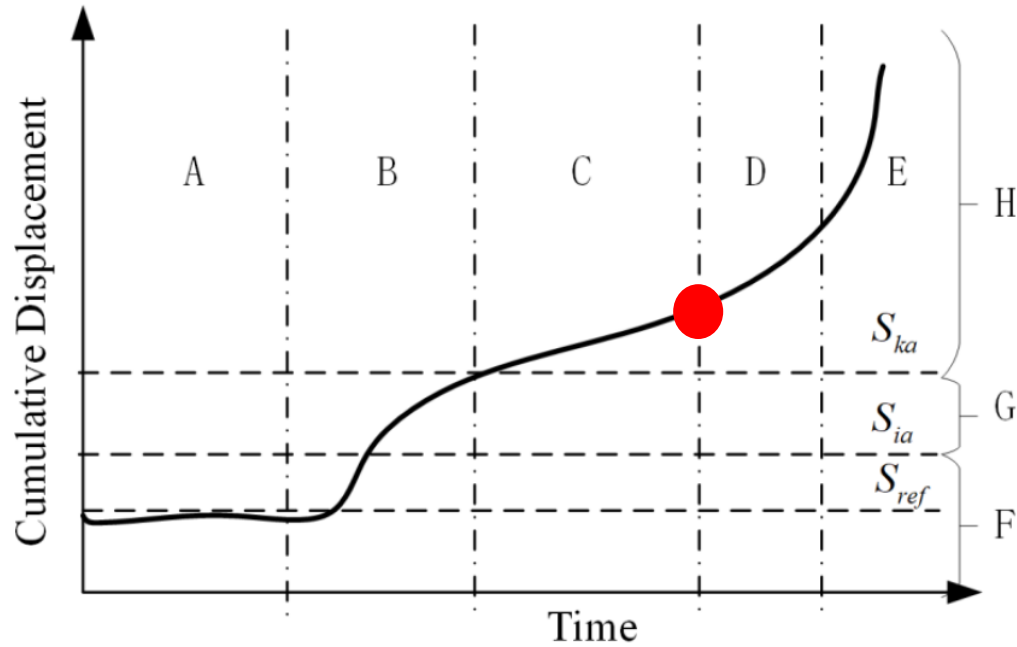
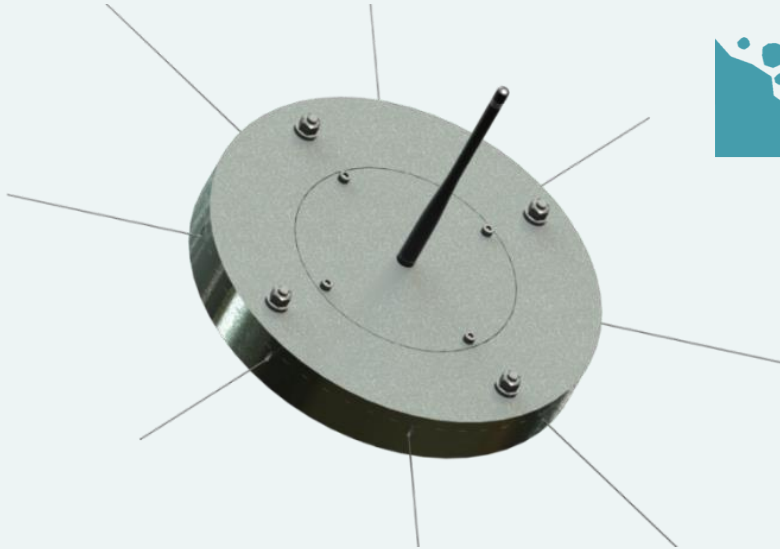


Figure 1. Refined landslide failure process. (A): Plateau stage, (B): Initial deformation stage, (C): Constant deformation stage, (D): Accelerated deformation stage, (E): Critical sliding stage, (F): normal zone, (G): initial attention zone, (H): key attention zone.



HELLOMAC



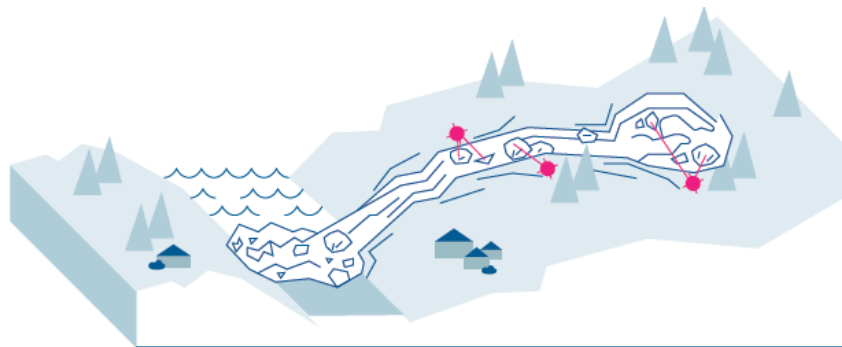
HELLOMAC

EARLY WARNING SYSTEM FOR ROAD
SLIPS, ROCKFALL AND LANDSLIDES

visit maccaferri.com/hellomac

- M** HELLOMAC is designed to be used as an **event alert system**.
- M** HELLOMAC is suited to monitor specific locations where natural events might occur thus the communities to act appropriately in sufficient time.

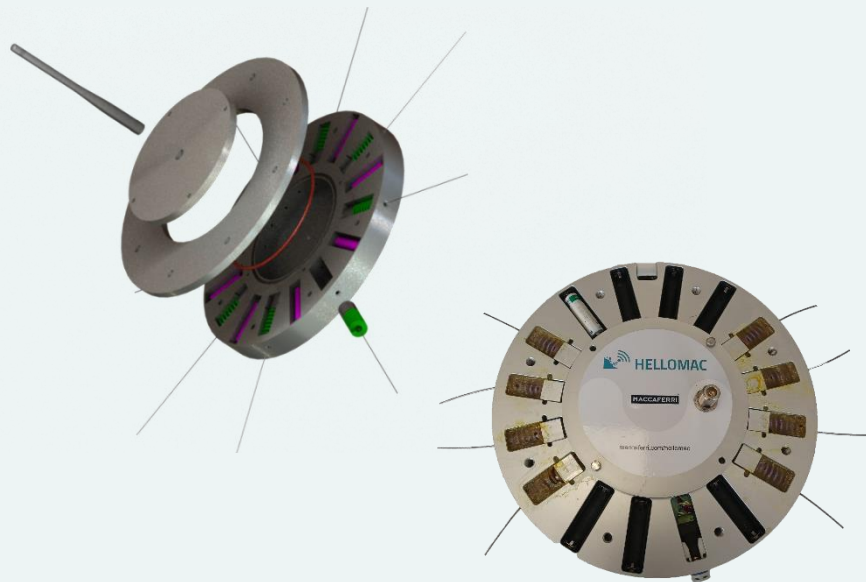
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HELLOMAC is a disk made of an alloy and with thin tie rods or “legs”.

The disk is the main part of the device and it was **tested to resist impacts** up to 16 g acceleration.

HELLOMAC is powered by 7 batteries with an estimated lifespan of at least **5 years**.



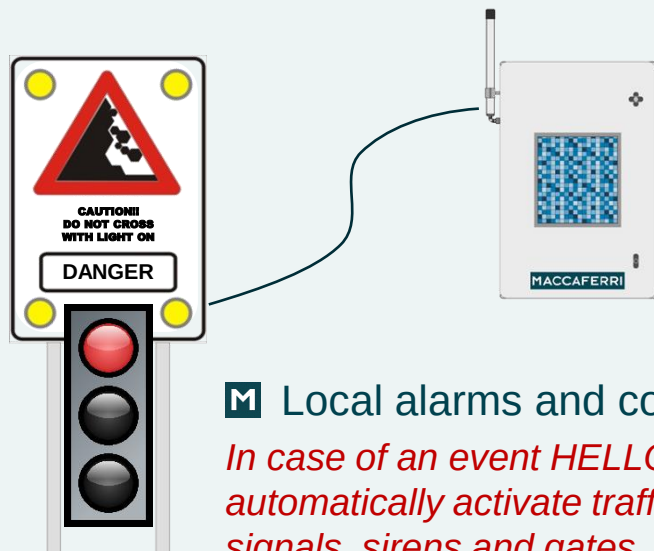
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CLICK ON THIS ICON TO **DOWNLOAD** ADDITIONAL
DOCUMENTS ON **HELLOMAC**



HOW DOES IT WORK?

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M Local alarms and commands

In case of an event HELLOMAC can automatically activate traffic lights, signals, sirens and gates.

M other sensors available



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HOW DOES IT WORK?

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HELLOMAC alerts people promptly.

M via **Satellite**
(Iridium)



***Never without
network coverage!***

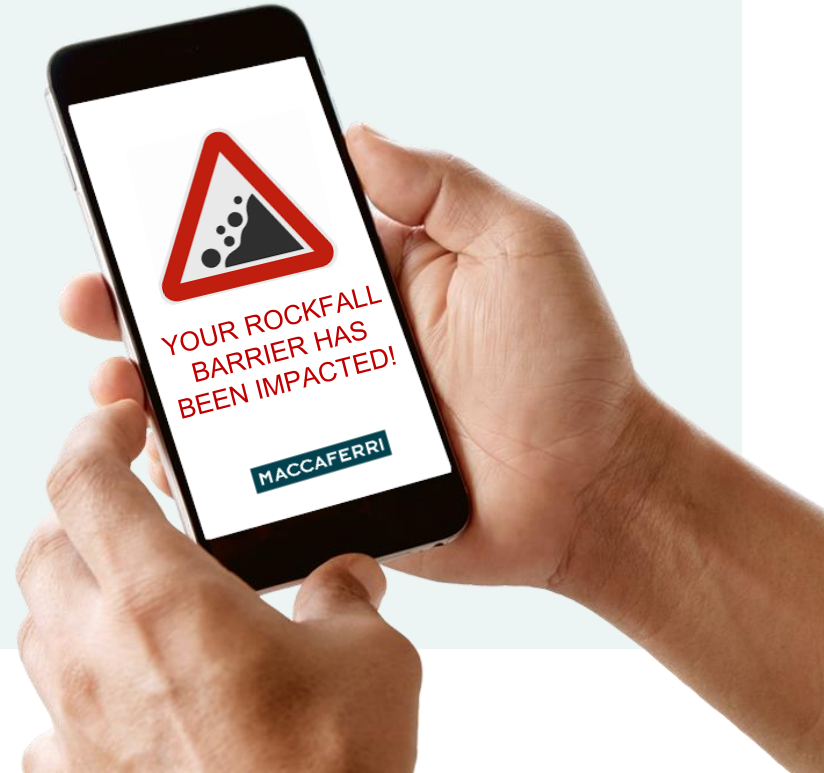
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Iridium is a global satellite communications company, providing access to voice and data services anywhere on Earth

With its constellation of satellites, Iridium's network connects people and devices in the world's remote places.

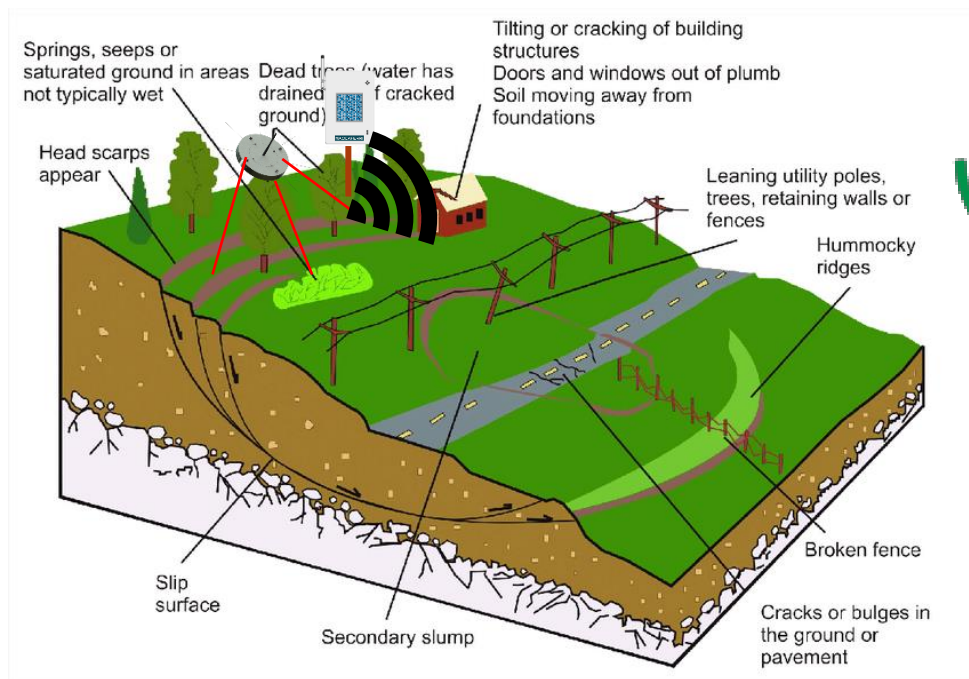
In the geotechnical engineering field, the integration of **IoT technologies** in automated monitoring systems plays a key role in overcoming the manual approach.



Early Warning System

MACCAFERRI

Simple and easy to install, Zero Maintenance, Low-cost and Reliable



IRIDIUM SATELLITE



INTERNET OF THINGS



HELLOMAC APP

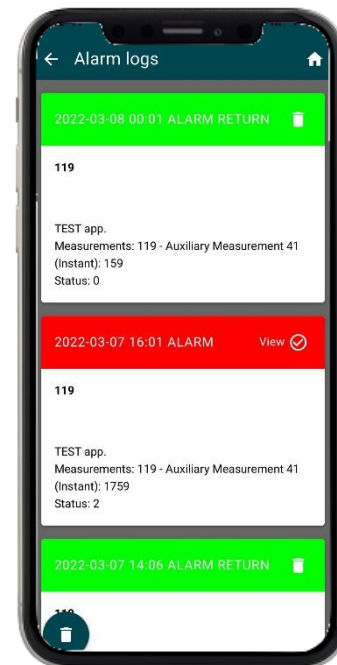
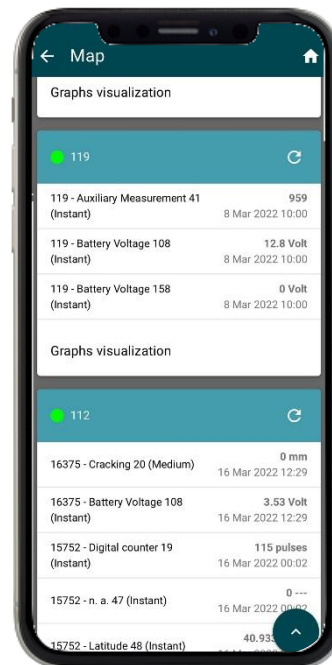
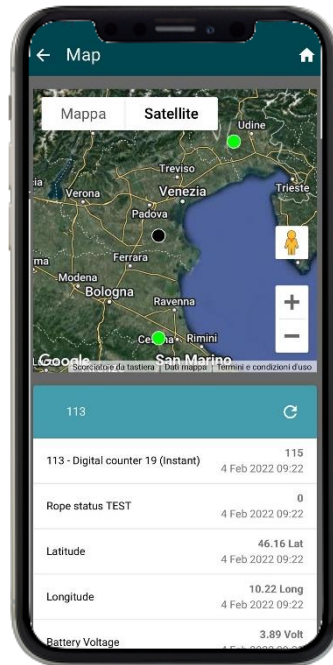
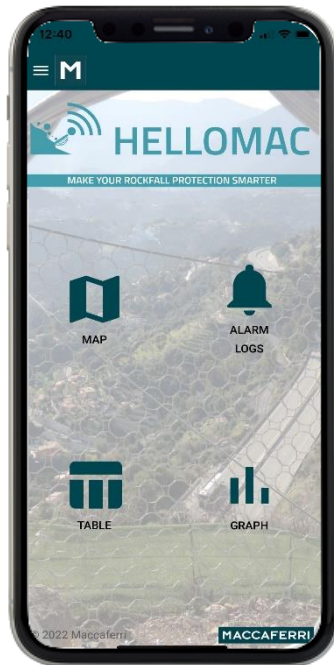
- M** Geolocation
- M** Alerts
- M** Notifications
- M** Data

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WHAT KIND OF INFORMATION CAN I HAVE?

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HELLOMAC IS AN ALERT SYSTEM



SERVICEABILITY UNDER CONTROL

An alert message is sent when the threshold level is reached; HELLOMAC not only inform you about the fact that an incident occurred but also on the status of the device.



DAILY UPDATE ON THE STATUS

The information are communicated on a daily basis or as soon as an even. The protection can be timely restored reducing hazards for people and assets.

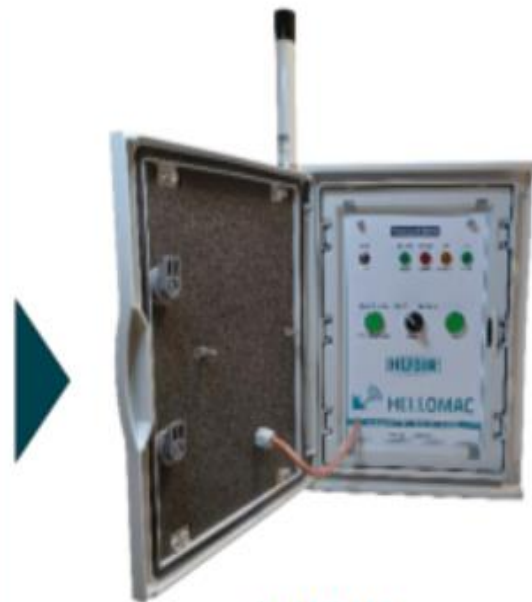
..other sensors are compatible



Stain gauge, inclinometer, etc.
Equipped with radio transmitter "SFL"



Compact meteorological station
Rain, temperature, humidity



HUBIR



MAKE YOUR ROCKFALL PROTECTION SMARTER



**MAINTENANCE
FREE**



**EASY TO
INSTALL**



RELIABLE

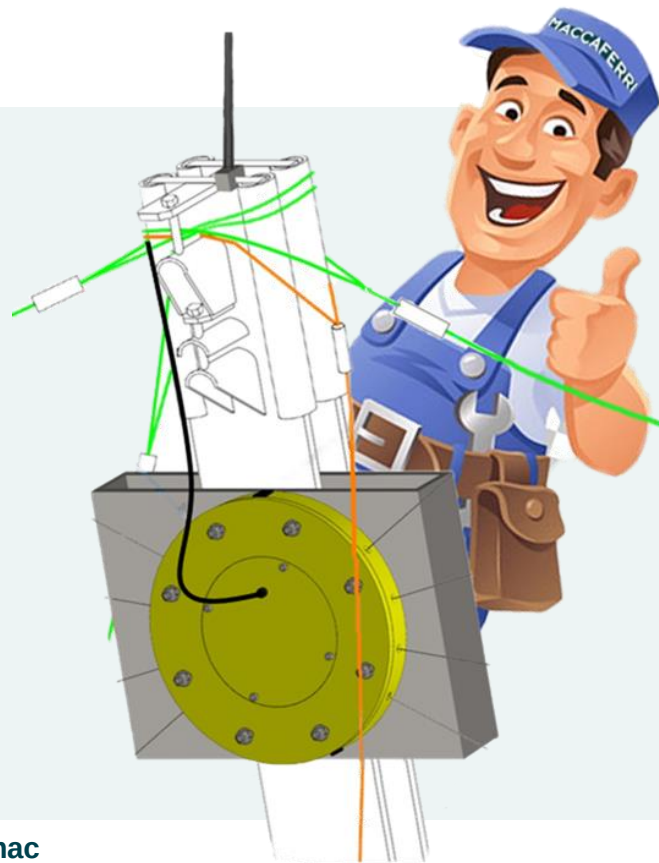
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EASY TO INSTALL

- M** Limited weight and small dimensions
- M** Easily fixed and no skilled workers required
- M** It can be installed on every rockfall protection, also existing ones



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MAINTENANCE FREE

- M** 7 batteries with an estimated lifespan of at least **5 years** avoiding any annual maintenance
- M** No **wiring activities**
- M** Designed to operate in aggressive climates
- M** Tested against impacts





RELIABLE

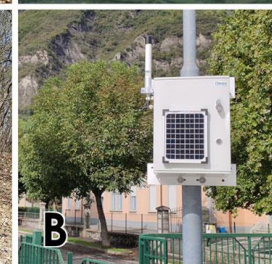
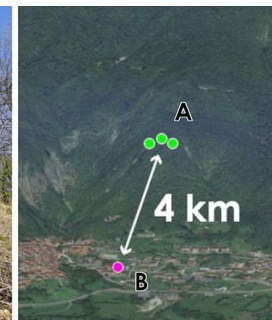
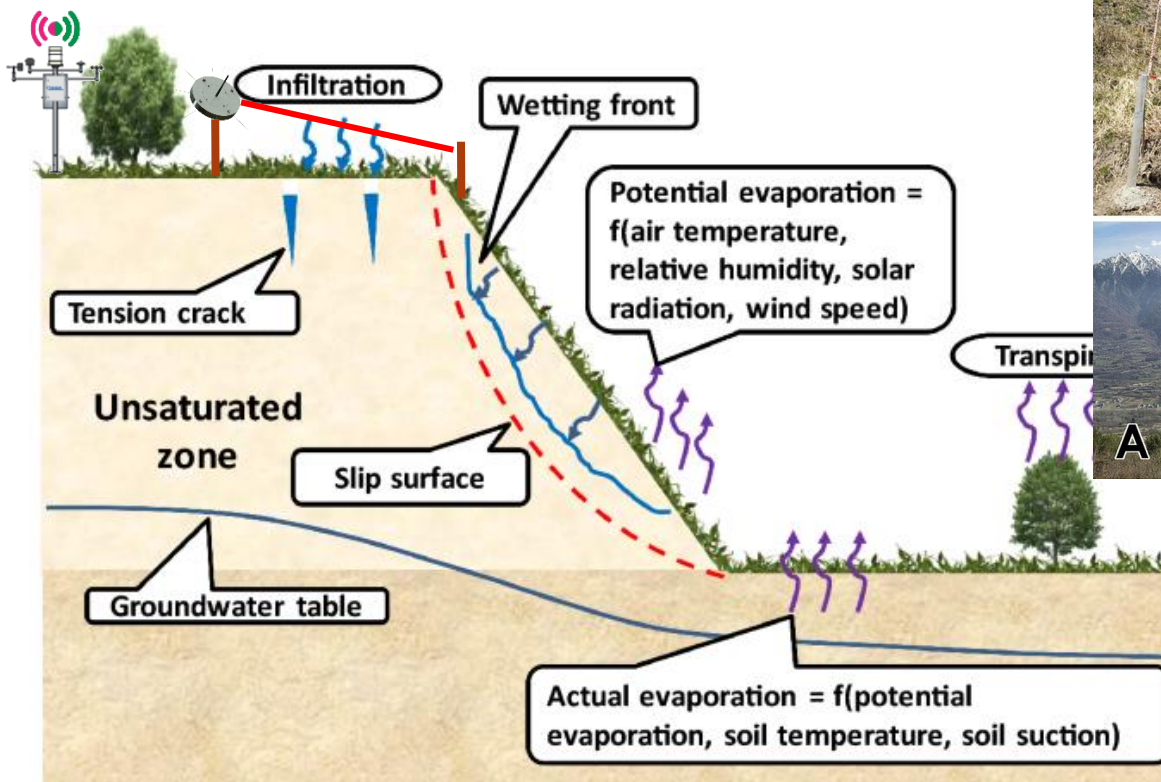
- M** Real-time alert system
- M** Daily transmission of the status for each protection system
- M** Never without network coverage
- M** One device, 8 sensors and complete detection of any movement

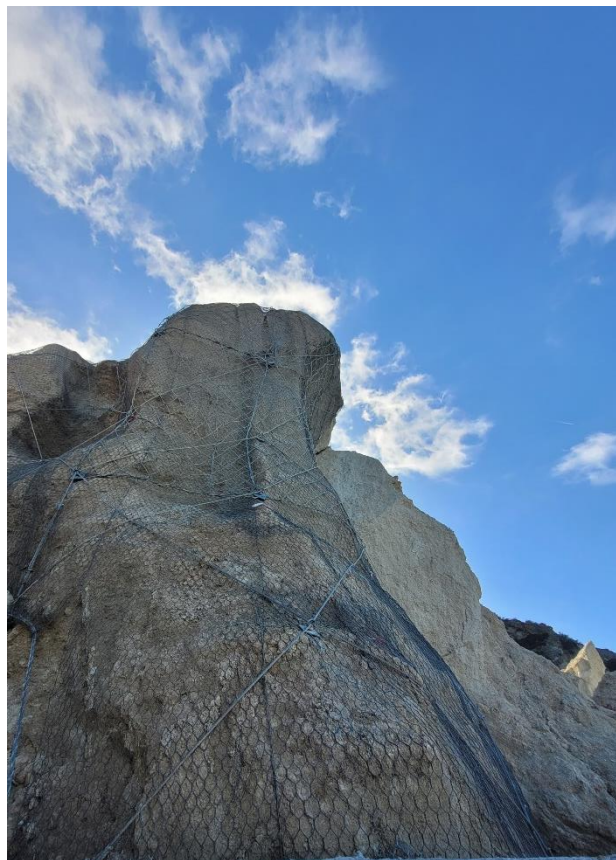


Applications

Unstable Soil Slopes

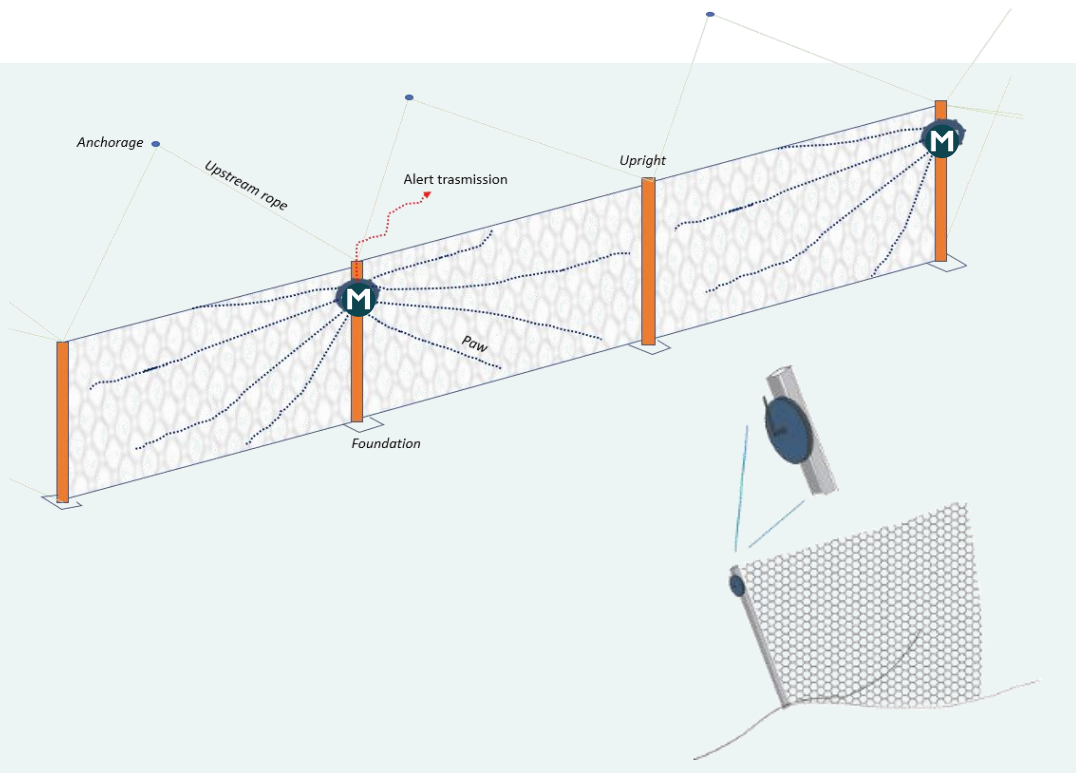
MACCAFERRI





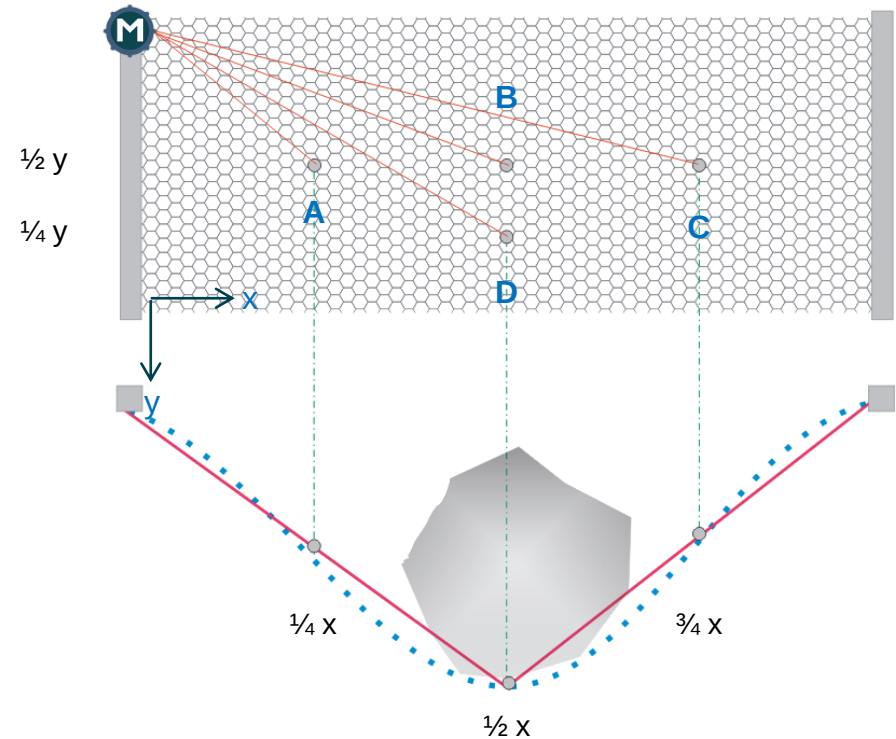
Rockfall Barrier / Catch Fence

- M** Tie rods or “arms”, fixed in specific areas of the rockfall protection to detect different points
- M** According to the model of the protection
- M** Possibility of retrofitting on existing barriers



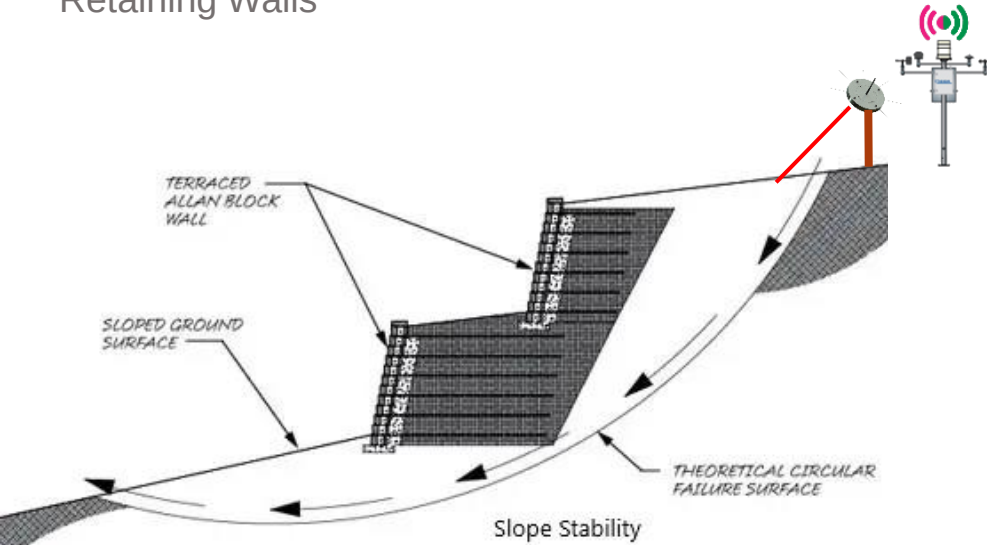
visit [maccaferri.com/hellomac](https://www.maccaferri.com/hellomac)

- M** Tie rods or “legs” are fixed in specific areas of the rockfall protection to cover a large area



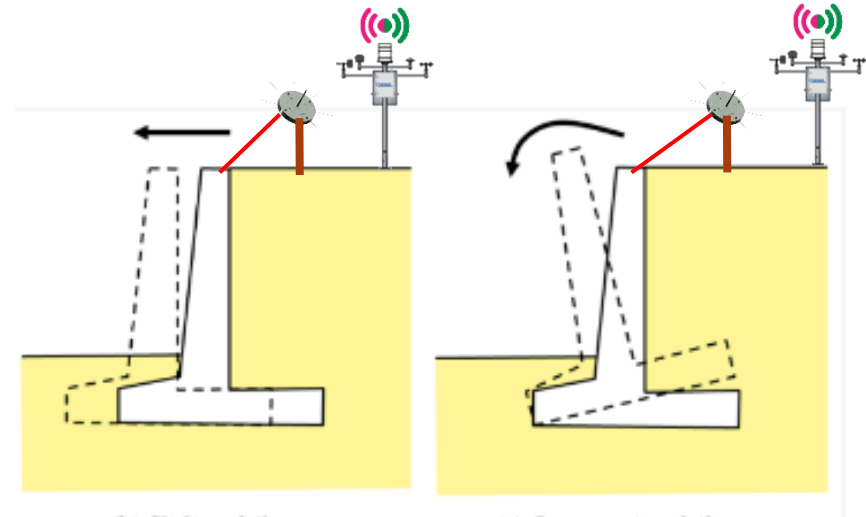


Retaining Walls



These phenomena are a risk for stability and can turn into dangerous events for infrastructures and people.

Event like extreme precipitation, earthquakes and subsidence can generate cracks and fractures on the ground and buildings.





A smart rockfall protection
in Cala Fonte,
Ponza, Italy



RELIABLE

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- M** **Never without network coverage**
- M** One device, **8 sensors** and complete detection of any movement



EASY TO INSTALL

- M** Limited weight and small dimensions
- M** Easily fixed and no skilled workers required
- M** Installation on every rockfall protection, also existing ones



MAINTENANCE FREE

- M** 7 batteries with an estimated lifespan of at least **5 years**
- M** No **wiring activities**
- M** Designed to operate in aggressive climates
- M** **Tested against impacts**



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Let's chat!

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