

RECONNECT

Regenarating ECOsystems with Nature-based solutions for hydro-meteorological risk rEduCTion



Hydro-meteorological monitoring activities in Portofino Natural Park (Italy) as a demonstrator of the H2020 RECONNECT project: preliminary results.

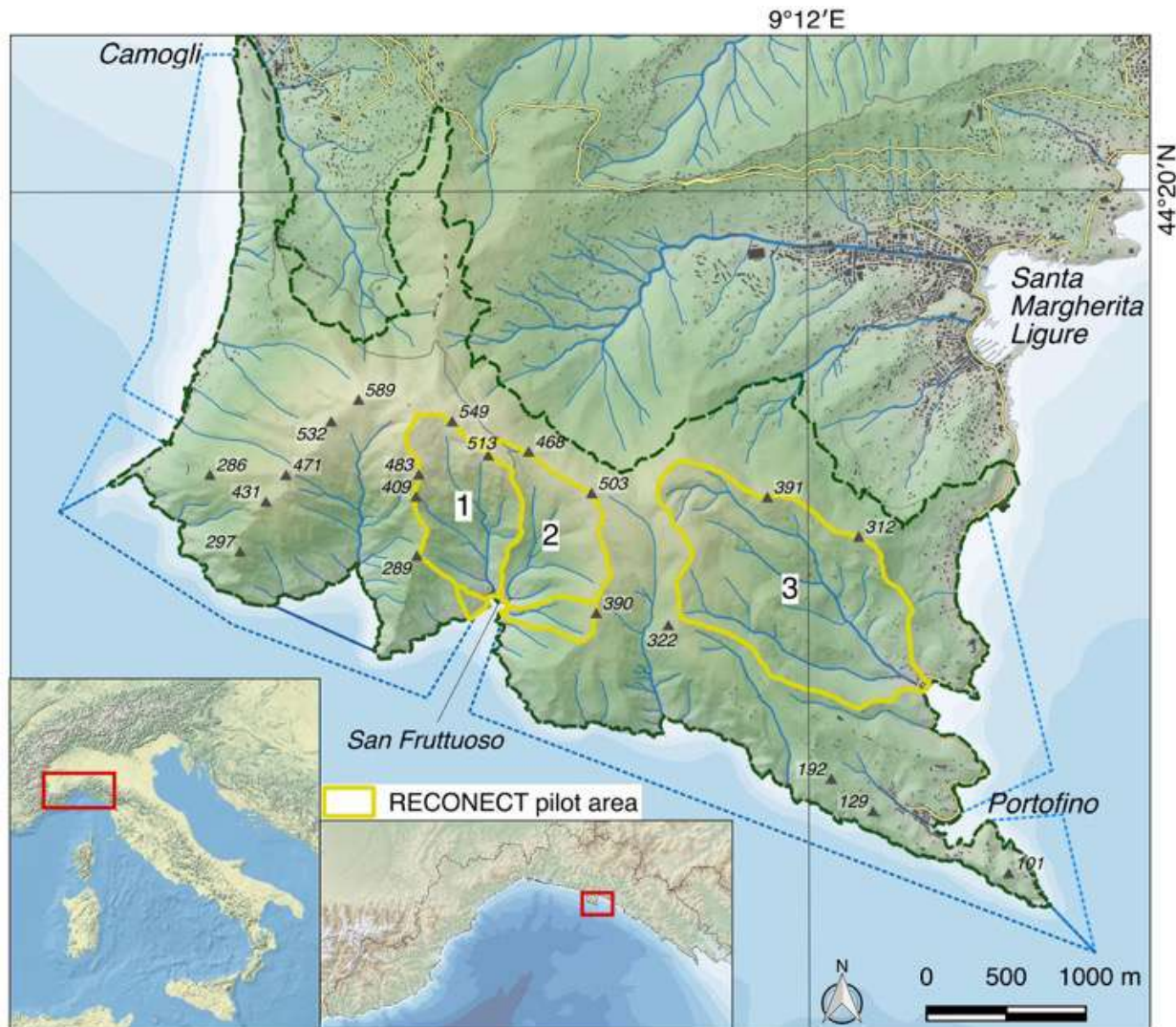
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Demonstrator A

Portofino Park, Italy



GISIG

Geographical Information Systems International Group

Portofino
cluster



Istituto di Ricerca per la Protezione Idrogeologica



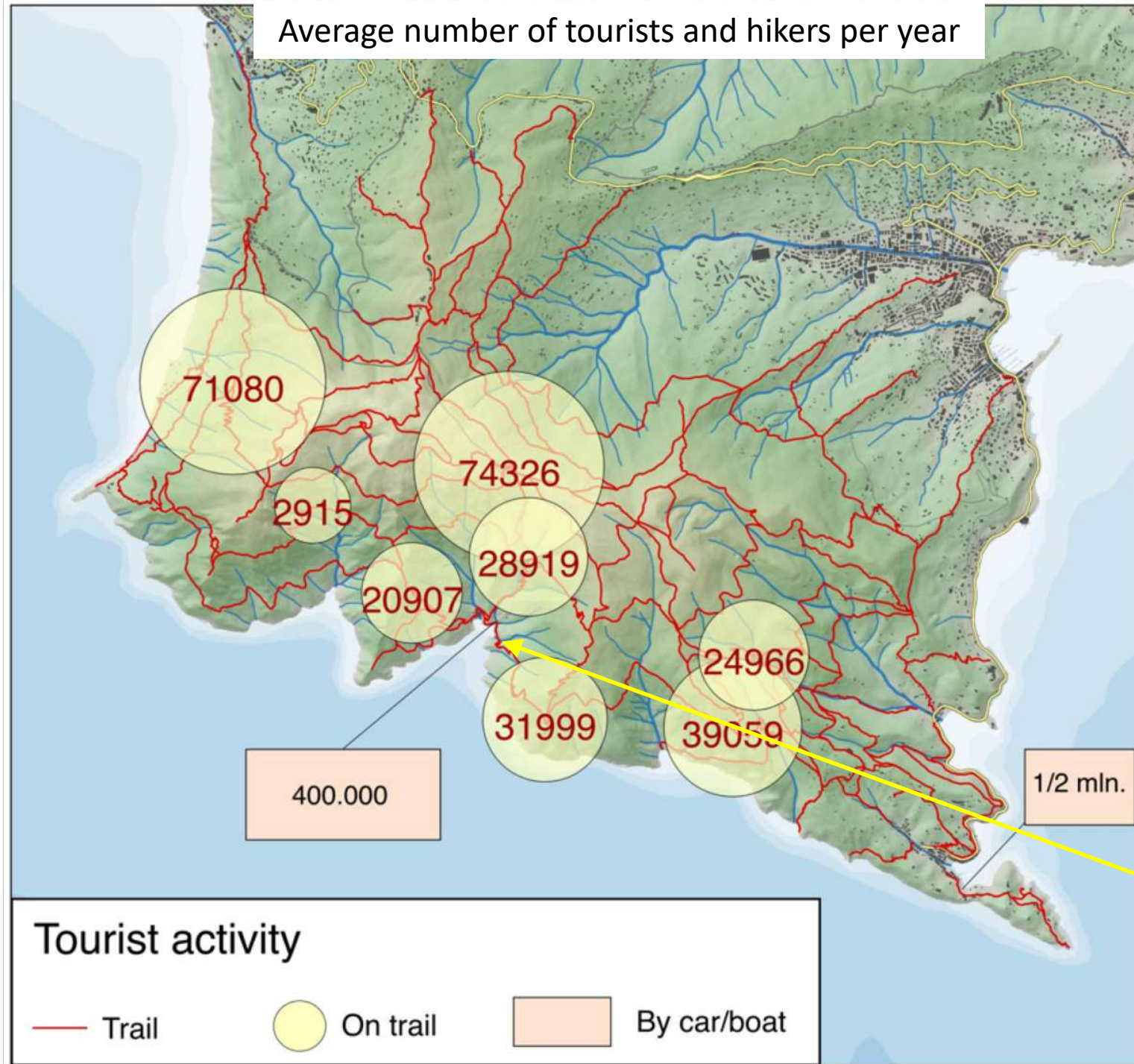
National Research Council of Italy

Peculiar morphologic layout:

- Small catchments
- Steep slopes
- Reduced time of concentration
- Peculiar microclimate
- Natural Park - Nature 2000



Average number of tourists and hikers per year



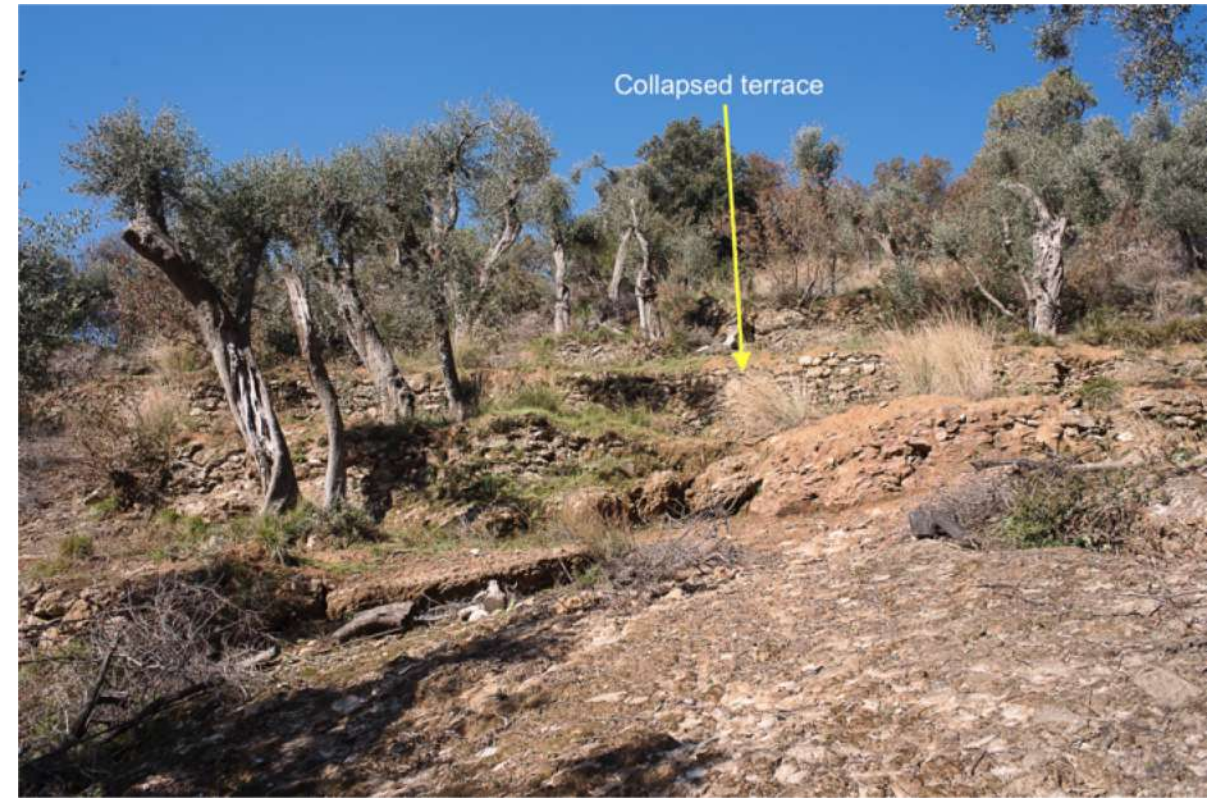
An outstanding area with high:

- Cultural, Historical value
- Aesthetic, Landscape value
- Socio-economic value

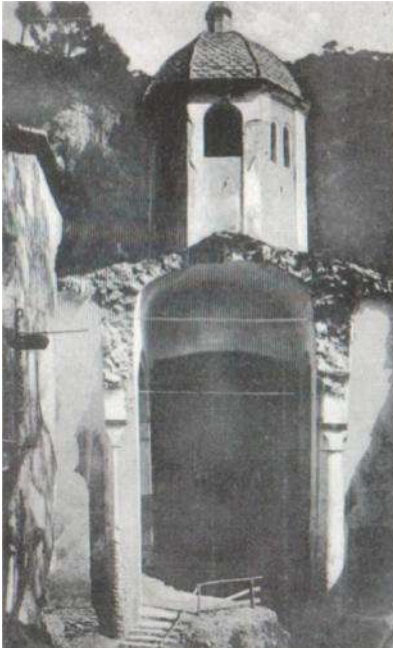


San Fruttuoso Abbey complex

- The catchment basin was greatly influenced by the Benedictine abbey, founded in the X Century
- The steep slopes behind the Abbey complex were terraced, the stream networks modified and land use variations occurred



Heavy rainfalls on 25th September 1915 caused the partial collapse of San Fruttuoso Abbey, due to debris descending from the slopes.

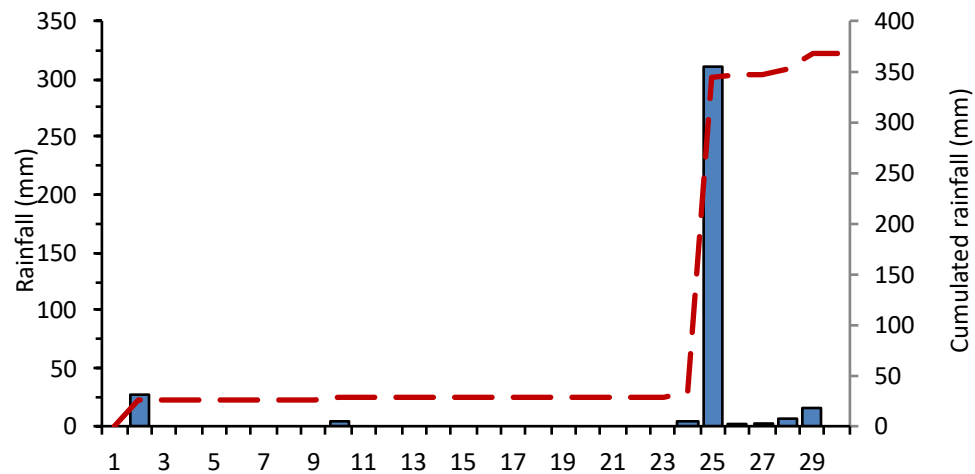


*Courtesy by Fondo
Ambiente Italiano*



*Courtesy by Fondo
Ambiente Italiano*

September 1915 – M. Portofino



Faccini et al., 2009;
Parodi et al., 2017;
Paliaga et al., 2020



1905

S. Fruttuoso di Portofino (Marcagliata)

1911 Kunze & Tappe



1916

A new beach appeared
after the 1915 event



1919

The San Fruttuoso
Abbey complex
1905-2020



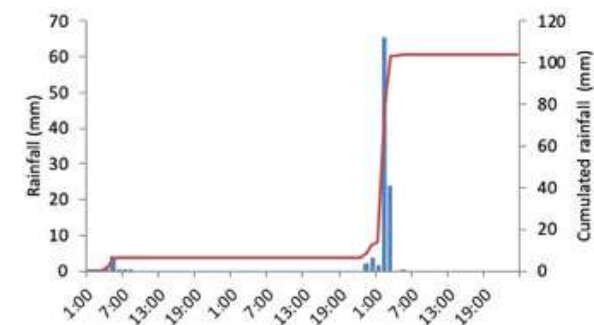
Present-day

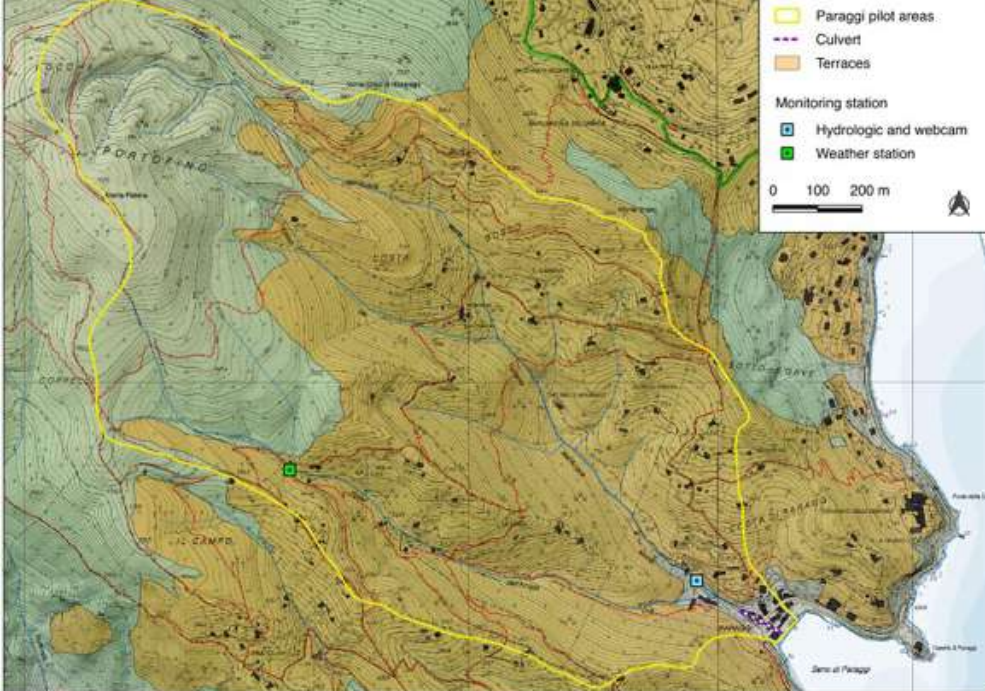
Main geo-hydrological events (2000-2019)

- 6 Nov 2000
- 24 Nov 2002
- 31 Oct 2003
- 1 Jun 2007
- 4 Nov 2011
- 18 Jan 2014
- 26 July 2014
- 14 Oct 2016
- 25 Oct 2016
- 29 Oct 2018

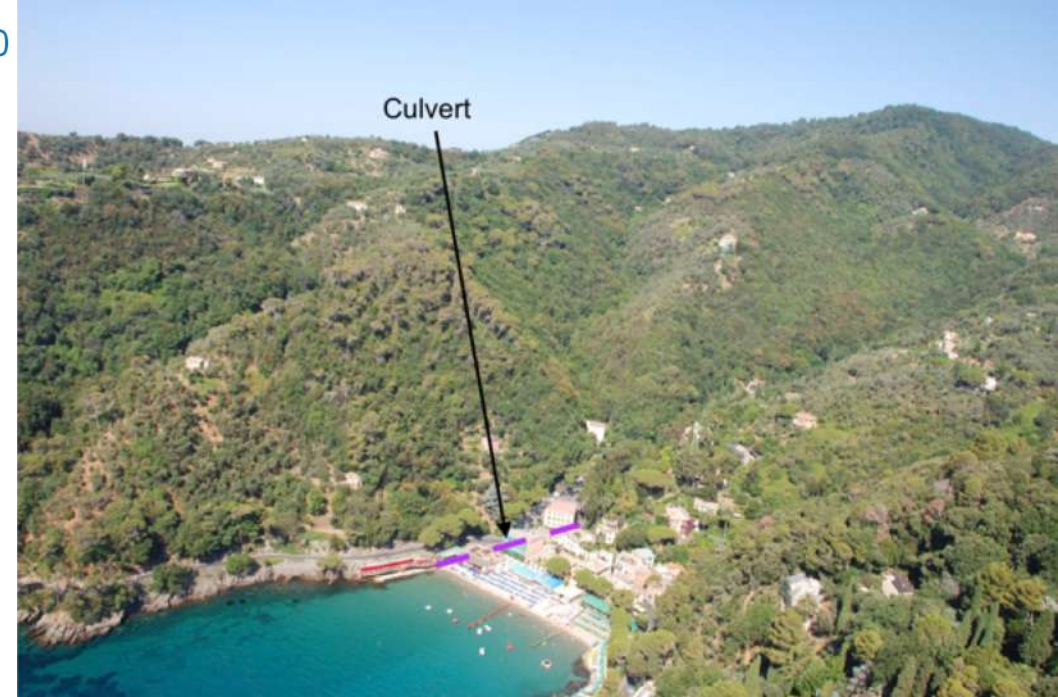


Mt Portofino, 24-26 July 2014

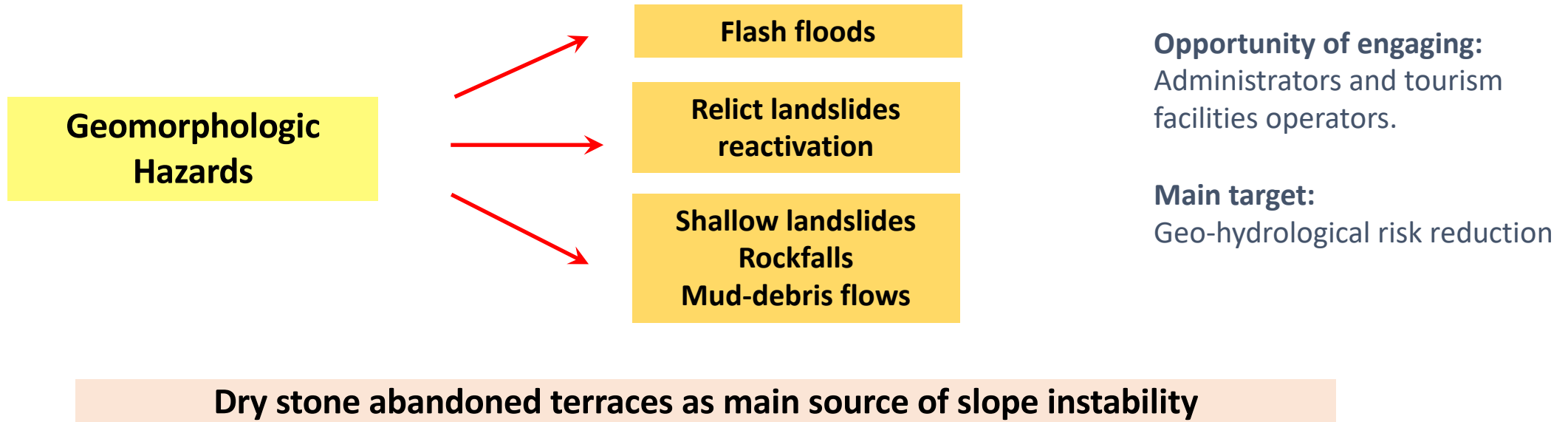




‘Valle dei Mulini’
pilot area



Project drivers



NBS RISK REDUCTION STRATEGY: A CATCHMENT SCALE HOLISTIC ECOSYSTEM-BASED APPROACH

Reduce the linear erosion along the streams

Reduce the widespread erosion along the slopes and increase stability

Improve hydraulic/geo-hydrological conditions

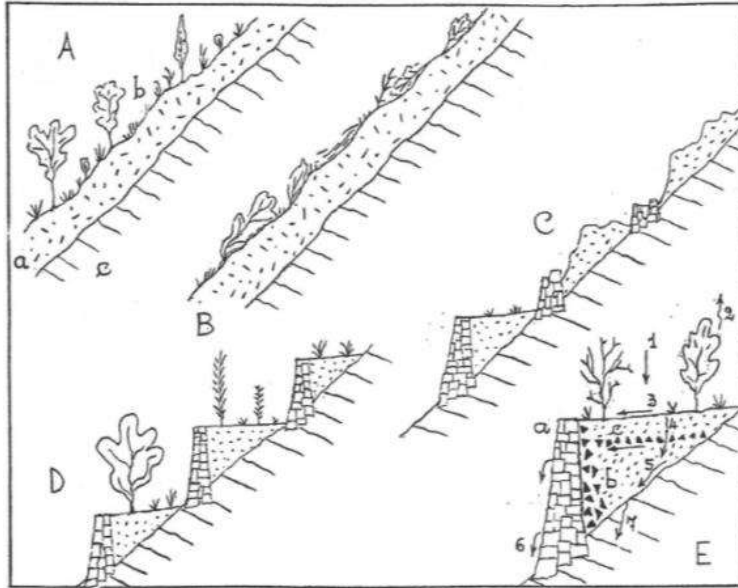
Footpath maintenance and erosion reduction

Terraces and dry-stone walls

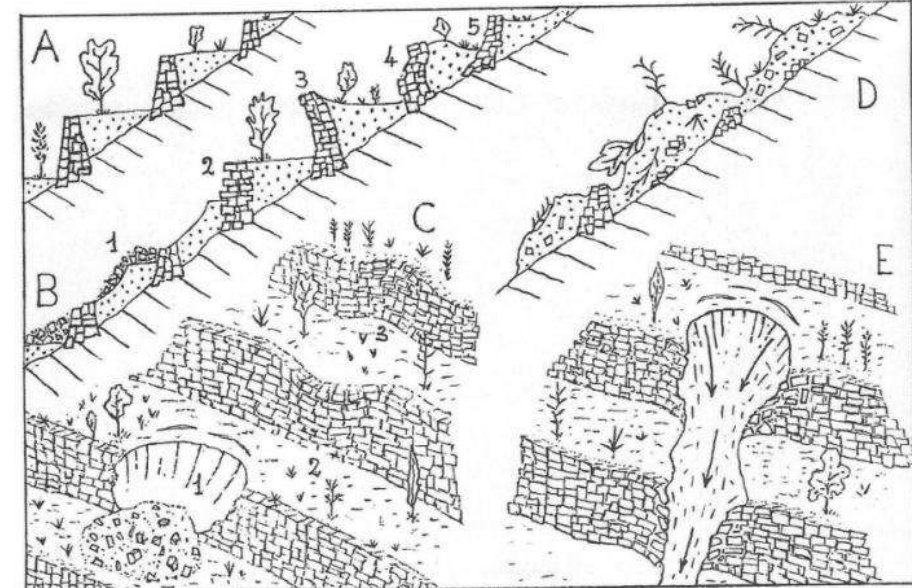
From and old best practise



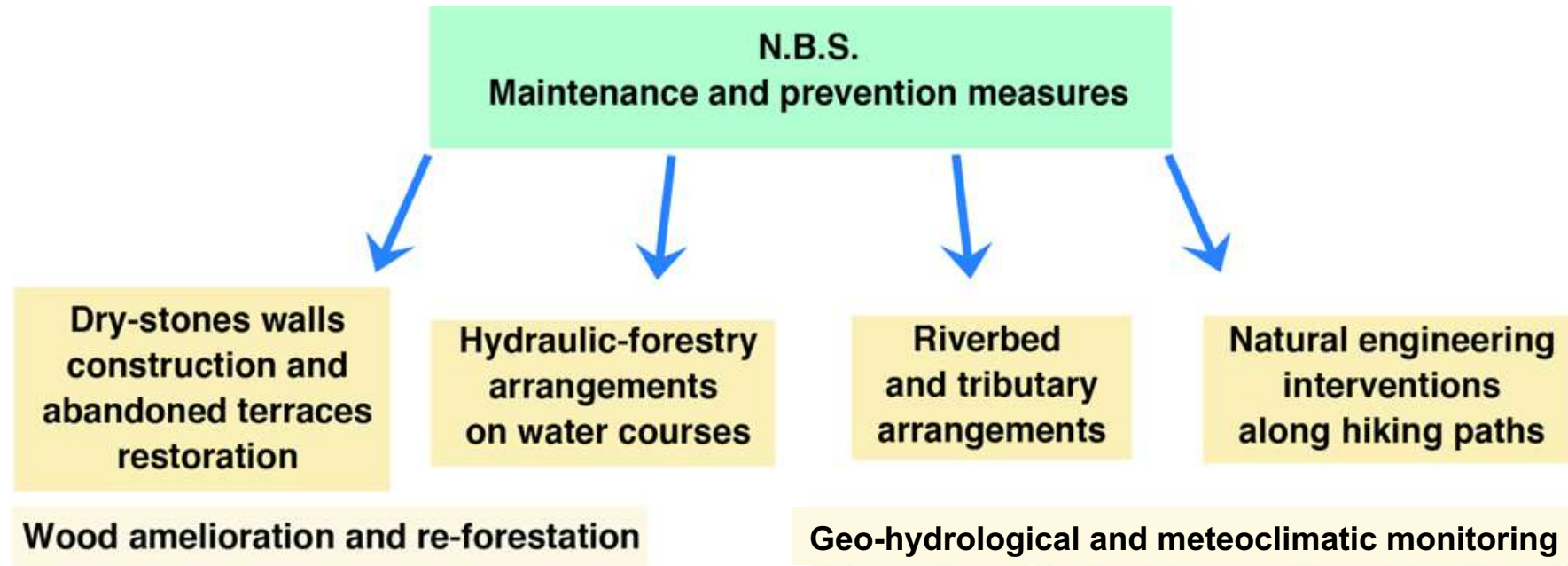
to a potential hazard for soil degradation, due to land abandonment



A = debris cover (natural) on the slope
 B = deforestation and slope preparation
 C = dry stone-wall construction and soil fills
 D = terraced slope, with orchards
 E = some details



A = cultivated and integrated terraces
 B, C = dry stone walls collapse along shear surfaces
 D = complete collapsed slope with terraces
 E = landslide for "domino effect" along slope with terraces

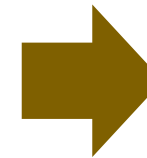
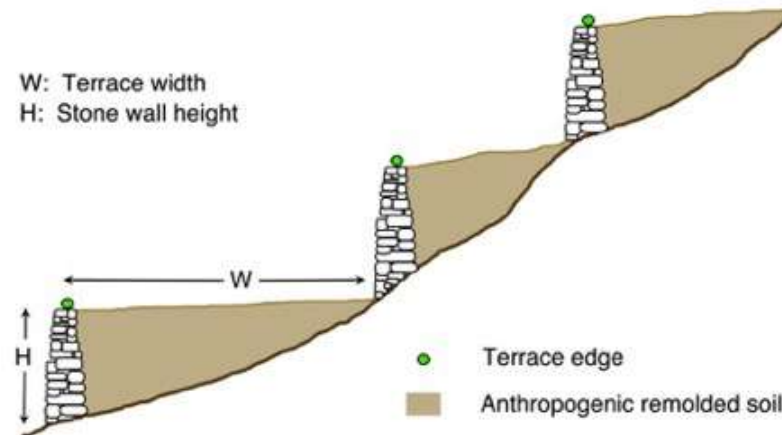


LIDAR survey



TERRACES EDGE DETECTION

W: Terrace width
H: Stone wall height



New methodology to estimate soil and debris volume immobilized into terraces

(Paliaga et al., AGU fall meeting 2018)

Monitoring activities



- **Remote Sensing survey**
 - LIDAR survey → terraces detection
 - Orthophoto survey
 - IR orthophoto survey → vegetation status
- **On-site monitoring**
 - 3 weather stations
 - 2 hydrologic stations

The Monitoring activities

Remote Sensing survey

Eurosense a RECONNECT partner



@ Genoa airport



The survey has been performed in *February 2020*, but the lockdown prevented the **ground control** to be completed. It is actually in progress due to restrictions reduction



The Monitoring activities

Remote Sensing survey

preliminary results

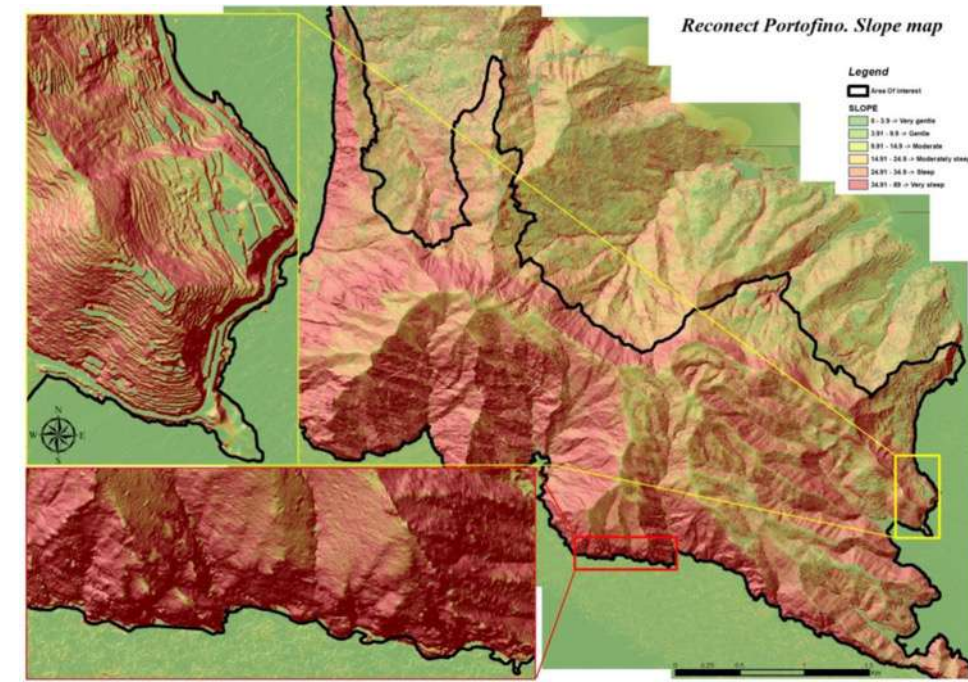
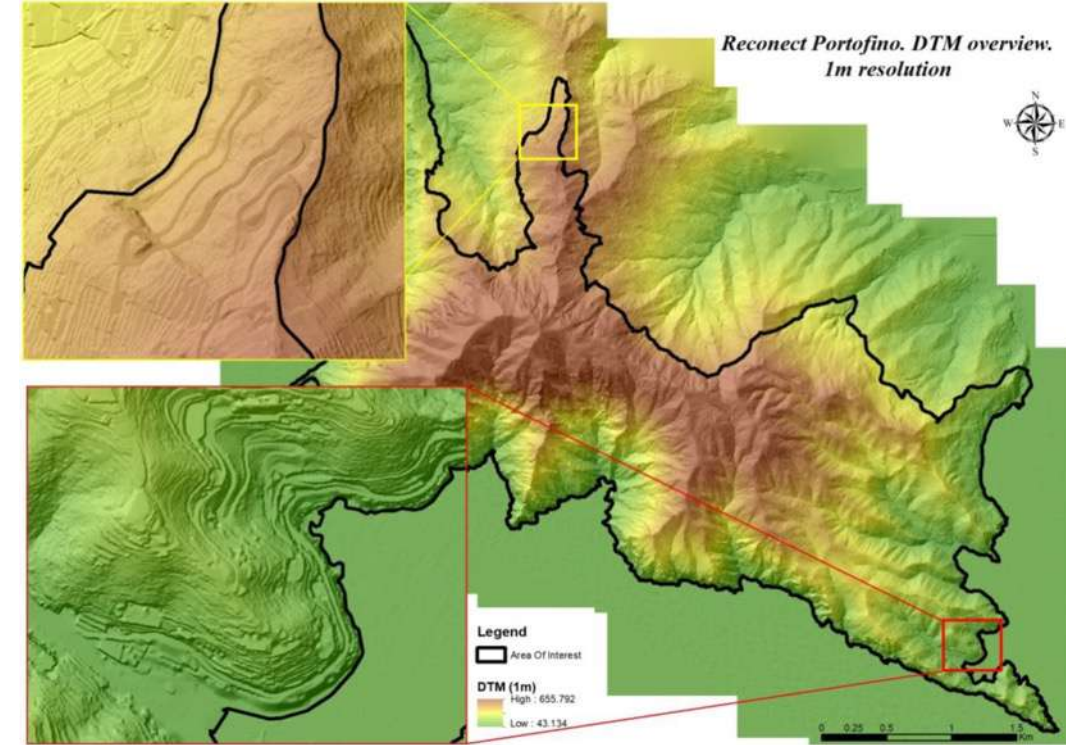
The high point density and top sensors quality will allow to obtain a **0.5 m** and **0.25 m DTM** after *points classification* in: ground, non-ground (includes vegetation, stone walls, buildings...), water and bridges.

Data will allow a precise detection of terraces and a detail geomorphometric analysis.

From the aerial images RGB- and CIR- orthophotomosaic will be obtained.

LiDAR system Riegl VQ 1560-II, with two 2 MHz sensors

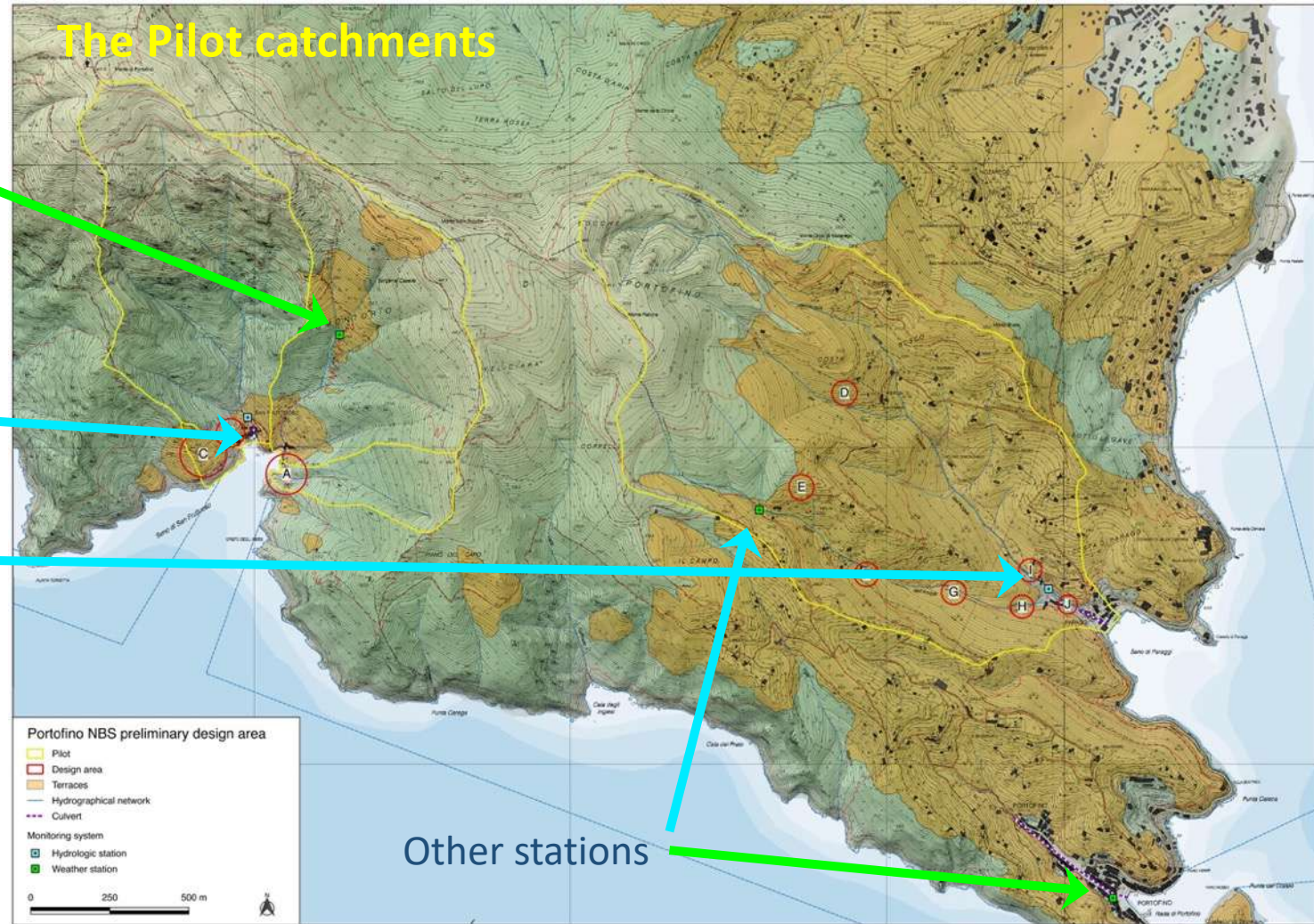
Point density= up to 20 m⁻²



Monitoring activities

On- site monitoring

Data management → TeleControlNet – InterAct platform



Monitoring activities – data management platform InterAct RECONNECT partner

File Allarmi Panormica Gestione Vista Aiuto

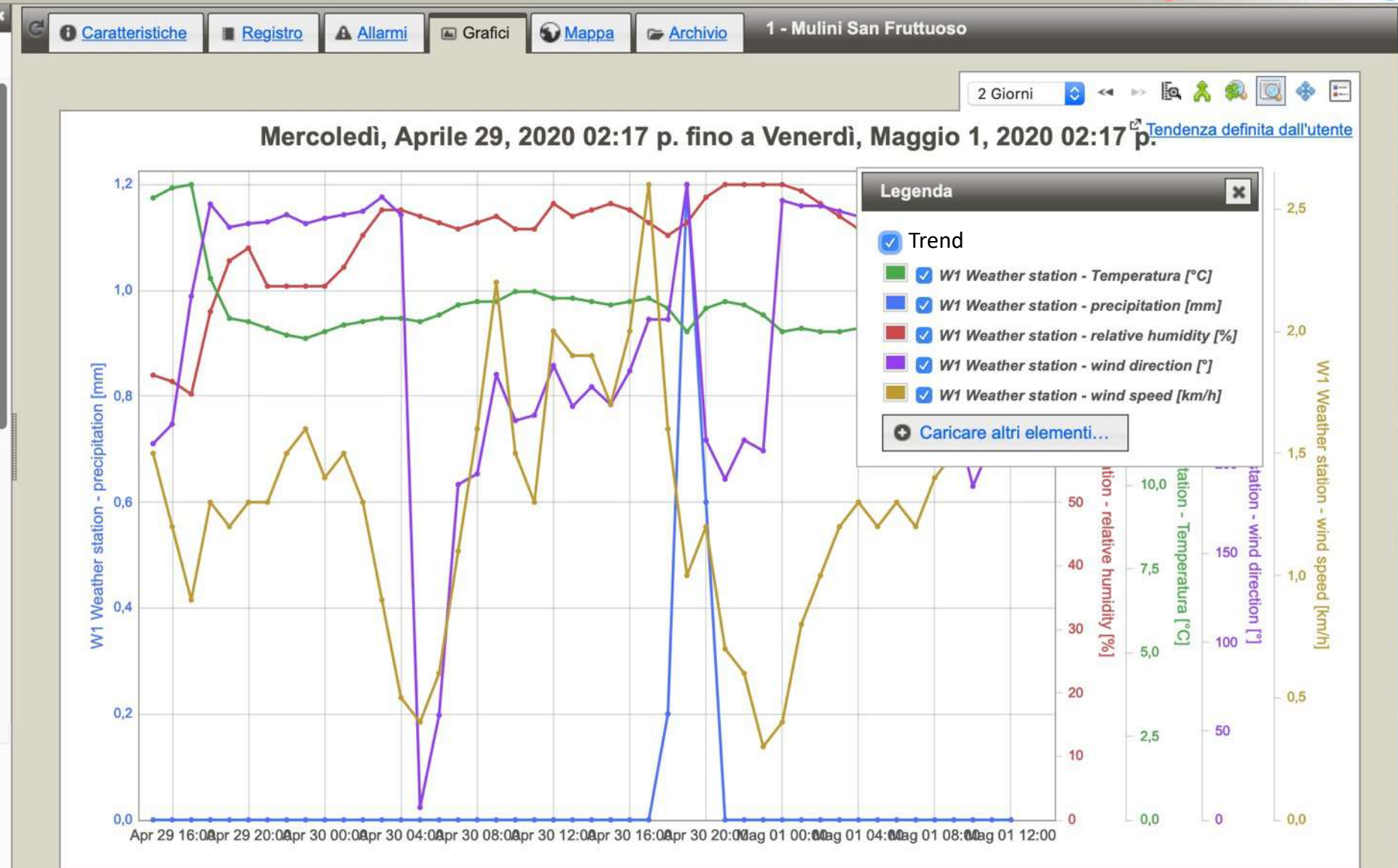
TeleControlNet

Navigazione

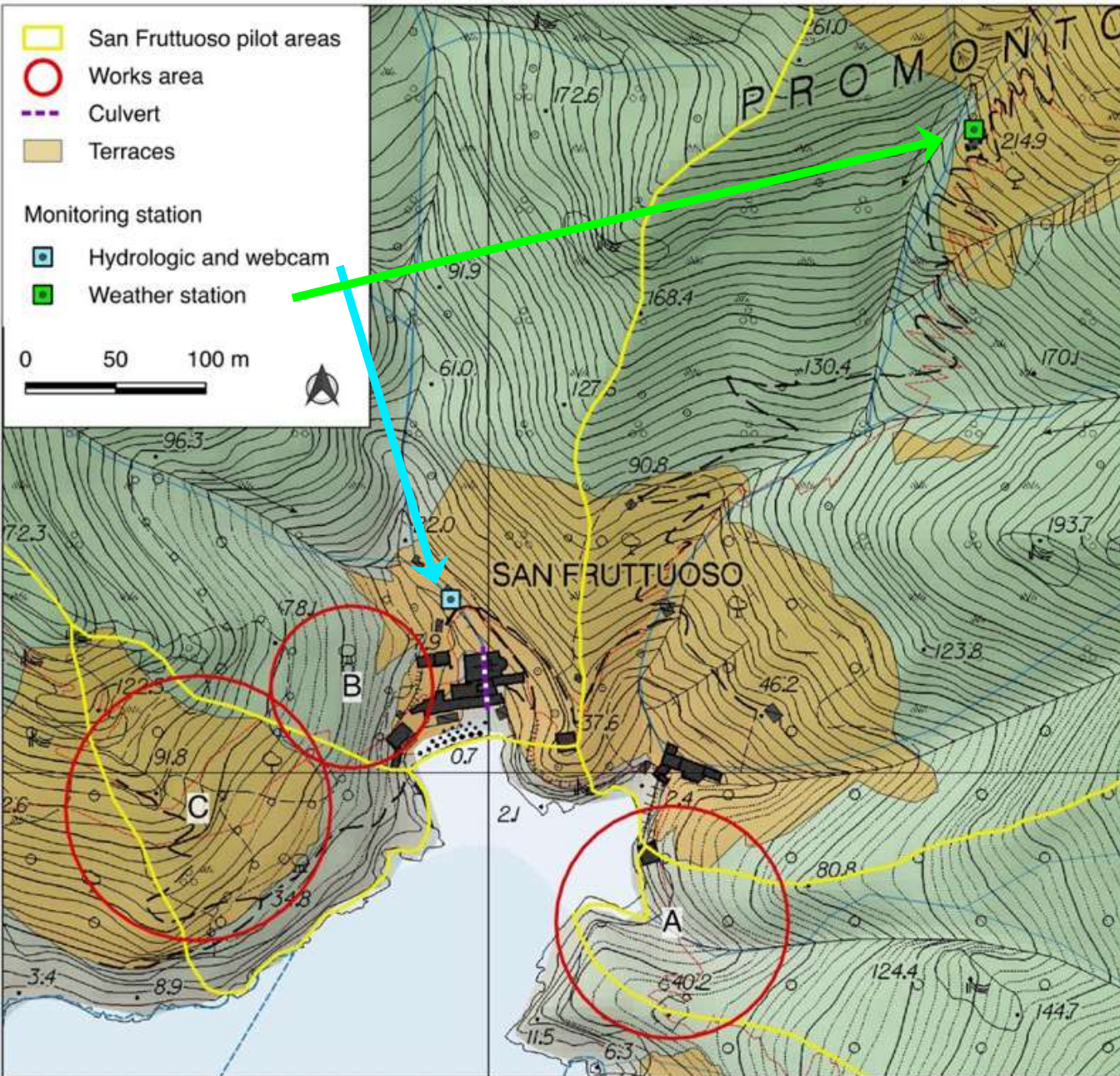
Trova oggetto

RECONNECT

- 1 - Demo
 - 01 - Public websites
 - DA1 - Elbe Estuary, Germany
 - DA2 - Seden Strand, Odense, Denmark
 - DA3 - Tordera river basin, Spain
 - DA4 - Portofino Natural Park, Italy
 - 1 - Mulini San Fruttuoso
 - 2 - Mulino del Gassetta
 - 3 - Portofino
 - 4 - San Fruttuoso
 - 5 - Paraggi
 - DB1 - IJssel River basin, The Netherlands
 - DB2 - Inn River Basin, Austria
 - DB3 - Greater Aarhus, Denmark
 - DB4 - Thur River Basin, Switzerland
 - DB5 - Var River Basin, Nice, France
 - DB6 - Les Boucholeurs, France
 - EC1 - Kamchia River basin, Bulgaria
 - EC2 - Pilica River Basin with tributaries, Poland



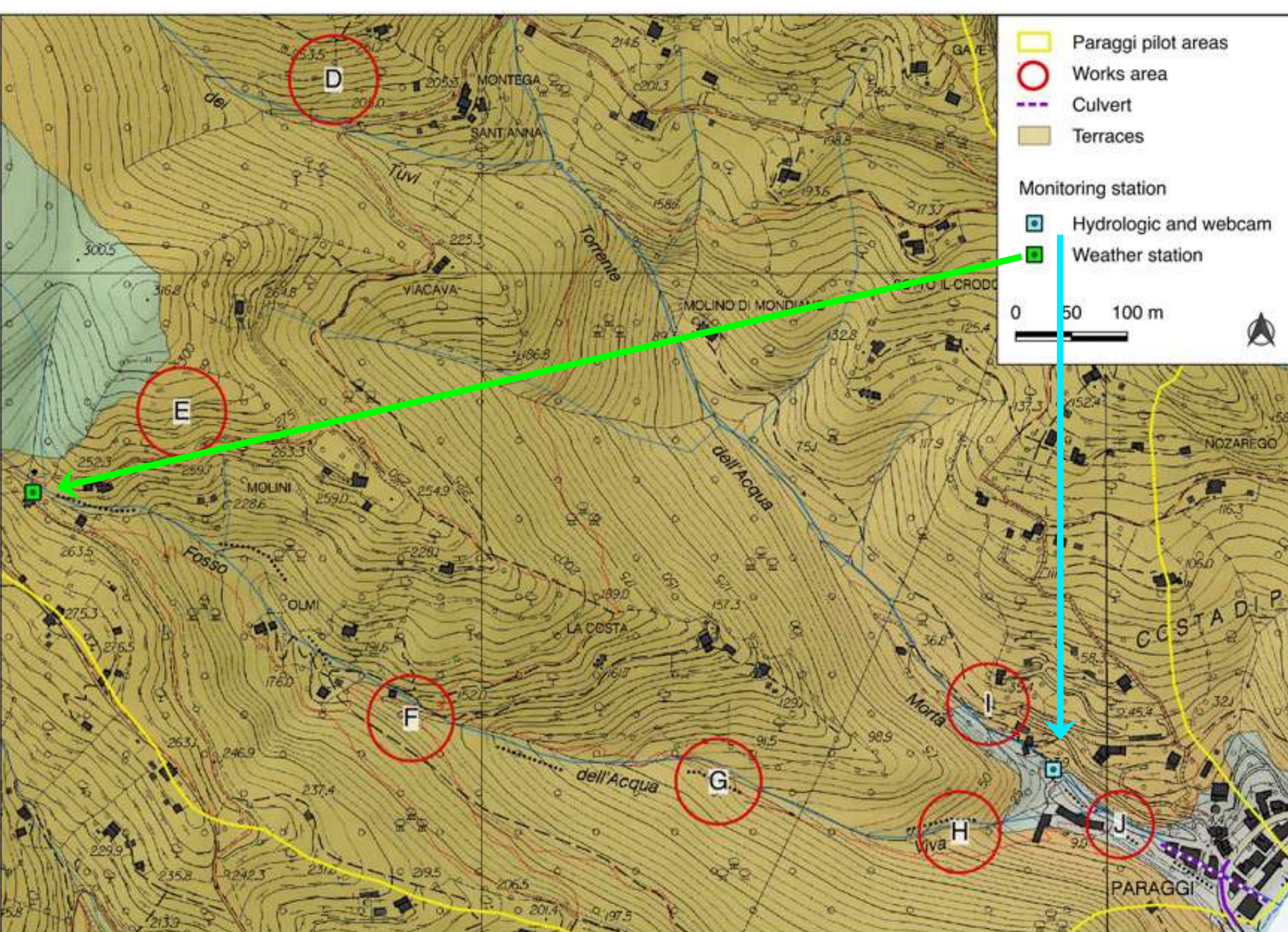
NBS measures in San Fruttuoso area



A) **Draining** running water in the compluvium with small stone walls in order to reduce erosion along the slopes; protection of the footpath and the Casa dell'Arco.

B) **Compluvium maintenance**; *wood amelioration*, by removing allochthonous and degraded species; regeneration of holms (*Quercus ilex* L.), the climax species in the area that has positive effect on the stabilization of the conglomerate slopes; wood and stone weirs to reduce solid transport into the stream. Consolidation of rock slopes for footpath and building securing.

C) **Stone walls recovery** and environmental engineering to slopes stabilization; proper plating of Mediterranean autochthonous shrub species to reduce erosion and improve slope stabilization.



NBS measures in Paraggi area

D) Terraces recovery to slopes stabilization and to avoid strong contribution of solid transport into the stream.

E) Footpath maintenance and recovery; vegetation cleaning along the stream and water flow improvement.

F) Stone weirs in order to reduce the flow energy and then the erosion along the stream.

G) Vegetation maintenance along the stream and water flow improvement.

H) Selective weir and small sediment trap to avoid saturating transport capacity of the culvert.

NBS benefits/costs

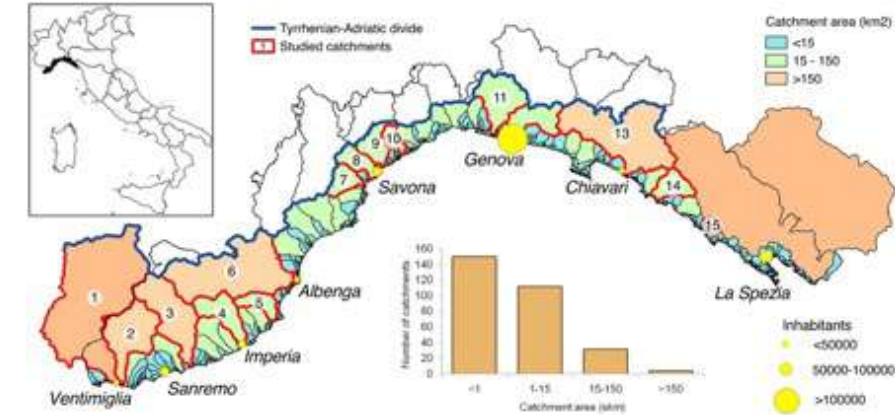
Expected benefits/co-benefits

- Decrease exposure to **geo-hydrological hazard** - infrastructures and cultural heritages
- Re-building/maintenance of **dry-stone walls** - geo-hydrological risk reduction , landscape (terraces are part of the landscape and cultural heritage), re-incentivize agricultural activities
- Decrease the impacts of **landslides** and **slopes instability** at coastal sediment budget level
- **Decrease the risk** of injuries among park visitors
- Support the **interaction** with private land owners
- **Integrate** the proposed NBS with regional policies for land management/planning
- **Improve** the visibility and the governance model of the Park
- **Improve** the collaboration between the Park Authority and the main local actors

Upscaling

The **geomorphological features** of the pilot area are **paradigmatic** of all Liguria and Mediterranean area:

- small catchments
- high slope gradient
- urbanization in the lower part
- stream terminal stretch completely culverted
- short time of concentration
- high geo-hydrologic risk



Similar features in other Mediterranean areas:

- Sicily and Campania regions in Italy
- Balearic islands in Spain
- Cote d'Azur in France
- Greek Islands
- Montenegro coastal areas

The risk reduction strategy:

Spread interventions at catchment scale - NBS



***Thank you
for your attention!***

<http://www.reconnect.eu>



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