Nature-based solutions to reduce hydro-meteorological risk in rural mountain areas

EC-H2020 Innovation action 'PHUSICOS'

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Nature-based solutions definition

- Solutions "**inspired and supported by nature**, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systematic interventions.

NB! Any approaches that do not improve biodiversity, are not based or delivering a range of ecosystem services, are not Nature-Based Solutions.

Nature-based solutions – co-benefits/expectations

- Contribute to green growth and citizen well-being
- Preserve and improve ecosystems (plants, fish stocks, etc.)
- Provide business opportunities
- Implement broader EU policies of Water Framework Directive, Floods Directive, UN's SDG’s, and the Sendai Framework for DRR.

Co-benefits of nature-based solutions

Ecosystem benefits

Economic benefits

Societal benefits

Risk reduction

Cultural heritage

Grey infrastructures like flood barriers can be made with the environment

https://prezi.com/p/xbp32glsmbzs/phusicos/

PHUSICOS – ‘According to nature’

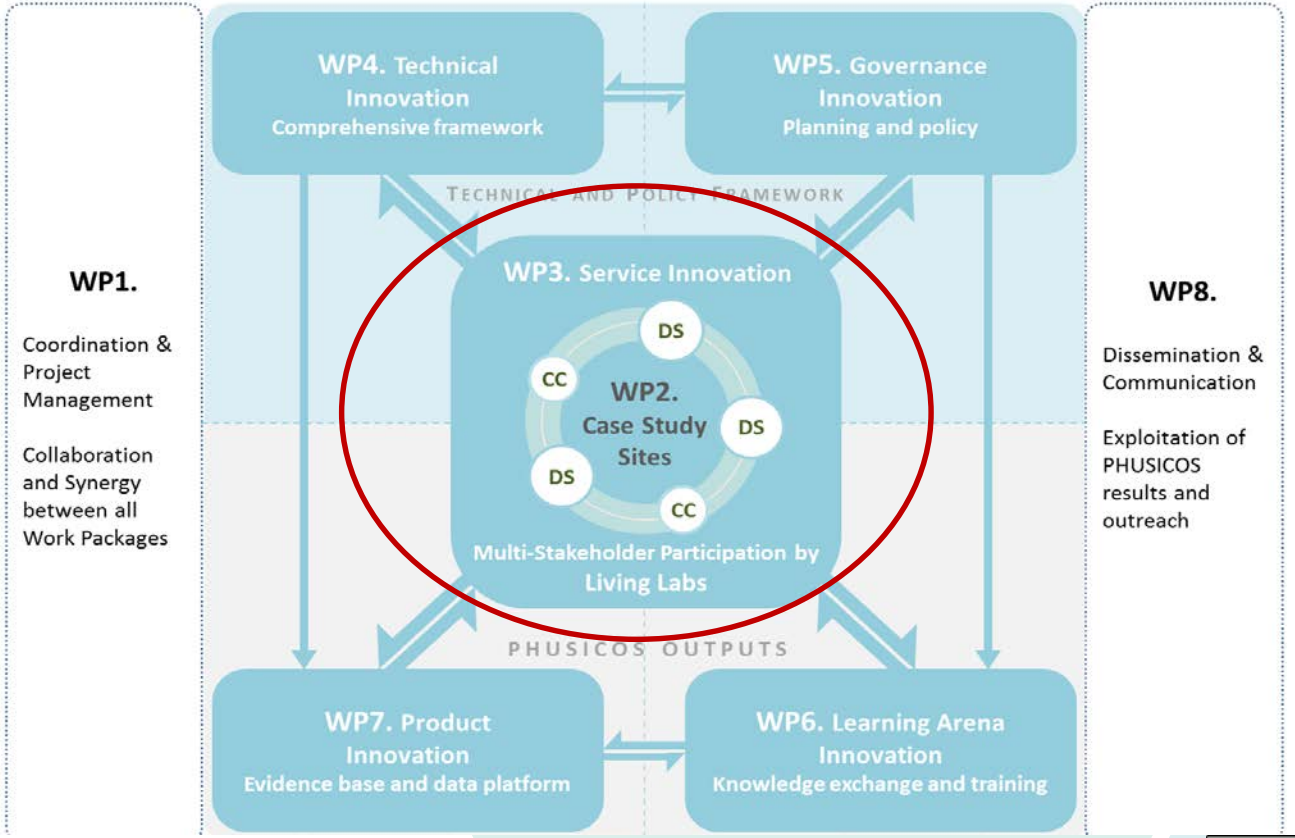
H2020 Innovation Action to **demonstrate** the implementation of nature-based solutions to reduce the risk of extreme weather events in rural mountain landscapes.

- The impacts of extreme hydro-meteorological events in mountain areas often affect entire river basins (flooding and landslides)
- Extreme weather events trigger rapid-moving mass gravity flows
- Managing water issues can help manage landslide and debris flow hazards downstream.
- Mountainous regions do not receive same attention as urban areas.

Illustration: The Norwegian Water Resources and Energy Directorate

PHUSICOS – an Innovation Action

- 8 Work Packages centered around case studies
- 15 partners from 7 countries.
- 4 years (2018-22), 10 mill. €



PHUSICOS Case study sites

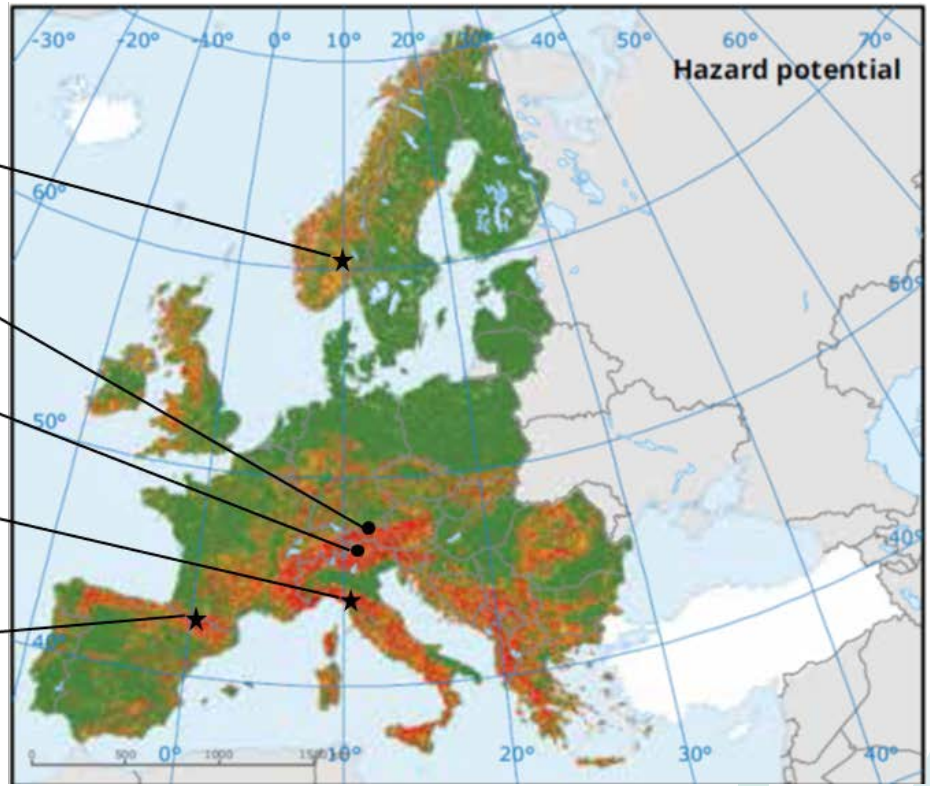
Valley of Gudbrandsdalen, Norway
Flooding, landslides and debris flows

Isar River Basin, Germany
Flooding and erosion

Kaunertal Valley, Austria
Landslides, rockfall and debris flows

Serchio River Basin, Italy
Extreme drought and flooding

The Pyrenees, Spain-France-Andorra
Landslides, rock falls and flash floods



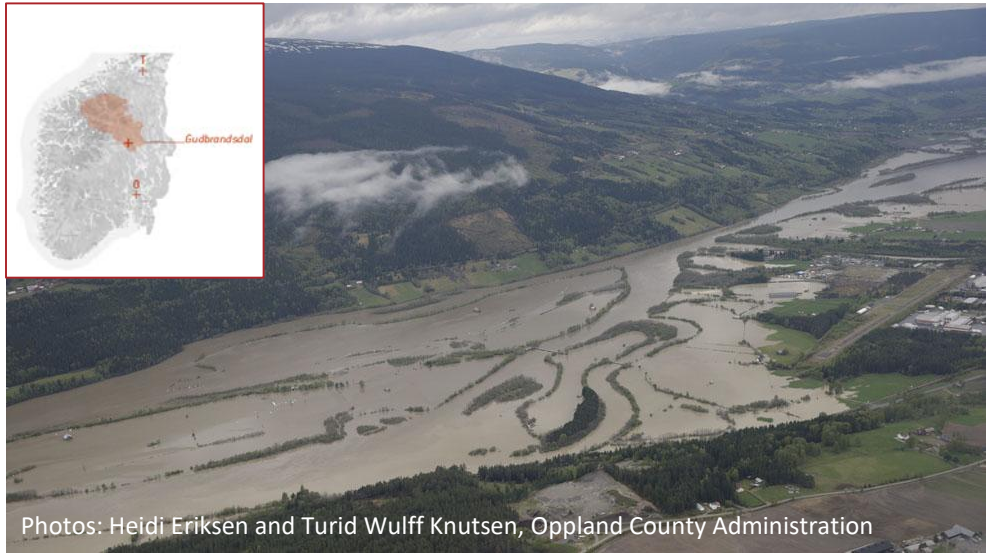
Map of hazard potential in Europe (EEA, 2014)

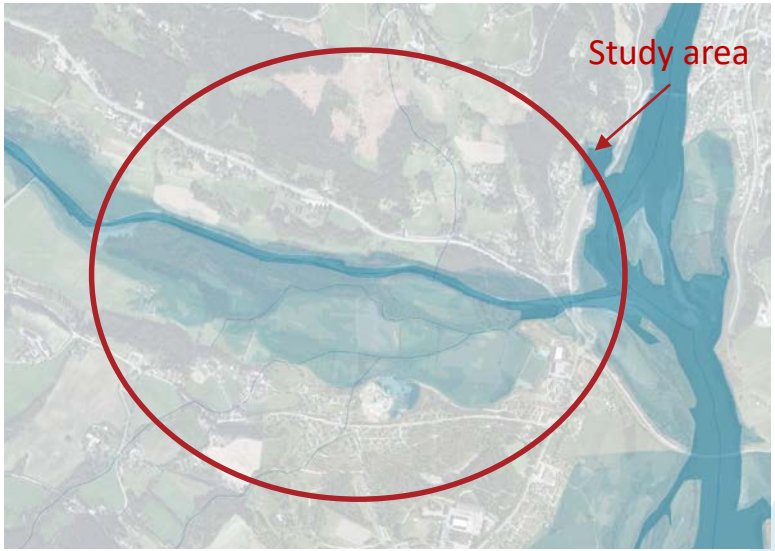
• Large scale demonstrator case site ★ Smaller scale concept case site

Valley of Gudbrandsdalen, Norway

Photos: from Heidi Eriksen and Turid Wulff Knutsen at Oppland County

Valley of Gudbrandsdalen, Norway





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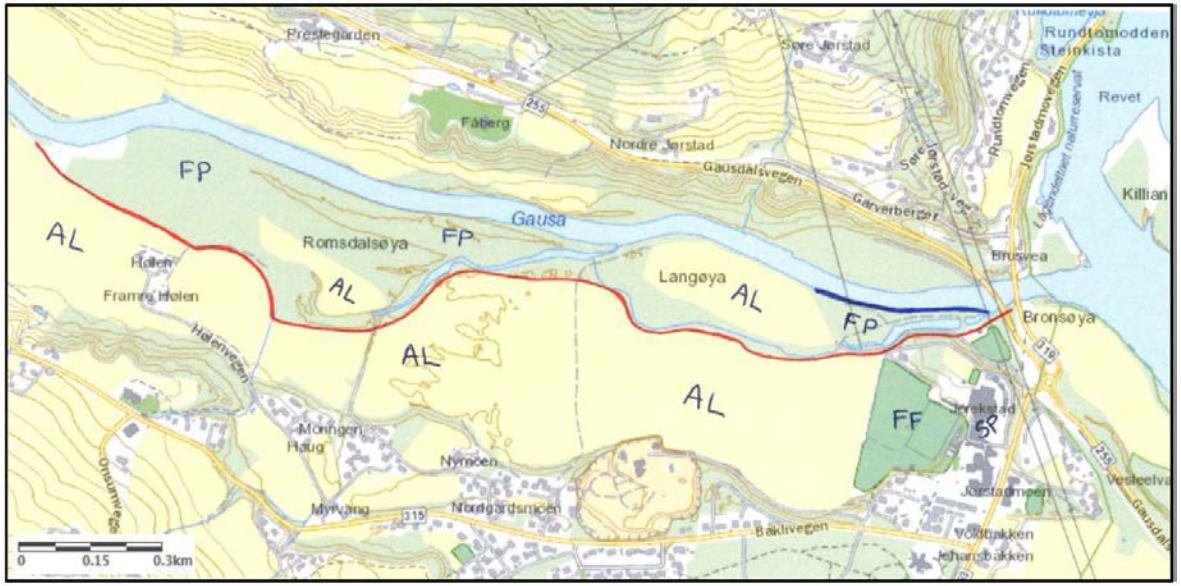
Increased risk of flooding due to heavy rainfall in combination with snowmelt

PHUSICOS case – Jorekstad flood protection



Red line: The proposed receded barrier
Blue line: Existing flood prevention measure / erosion protection of the Gausa riverbank, to be removed.

- Receded flood barrier to allow more space for flooding.
- Protects sport facilities and housing, as well as farmland.
- Avoid problems with sediment deposition and shallowing of main river Gudbrandsdalslågen
- Restore flood plane (FP) riparian vegetation, with several red-list species.
- Agricultural land (AL) inside the receded barrier is also flooded during extreme events today

Jorekstad, Norway - receded flood barrier & design suggestions

Situation today. Orange line: proposed barrier

Landscape architects' (AgenceTer, France) ideas for design.

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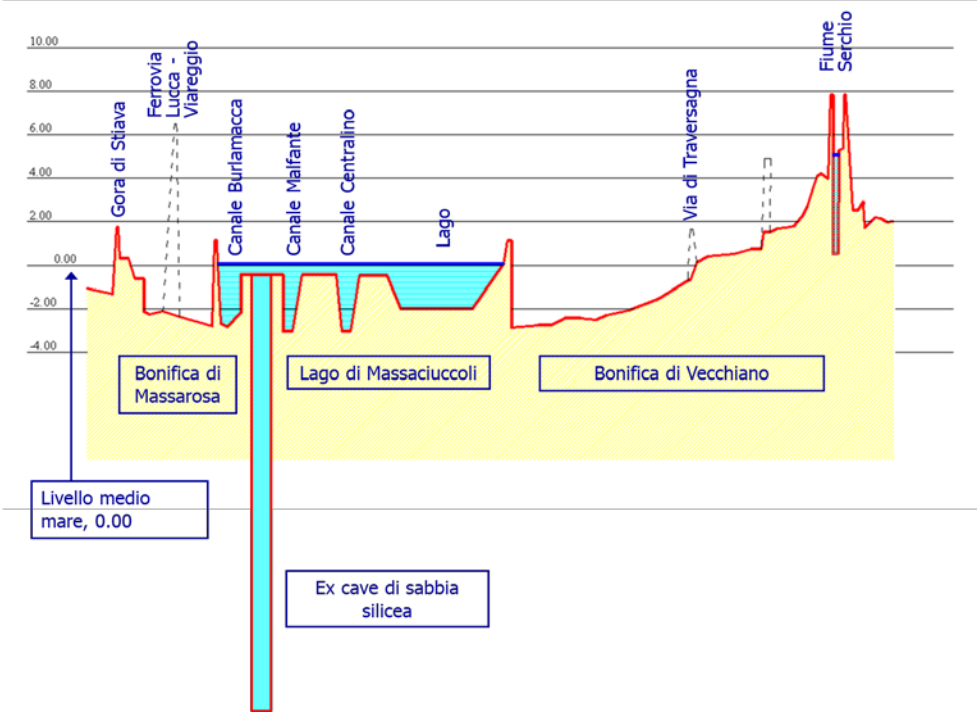
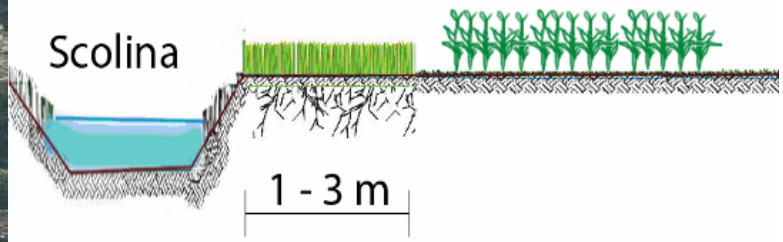
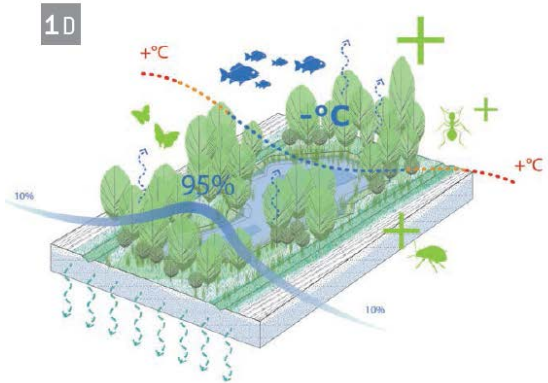
Serchio River / Lake Massaciuccoli, Italy

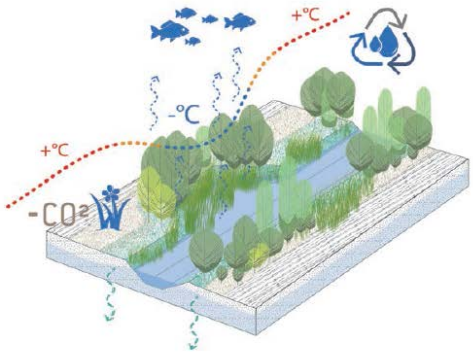


- Transfer water from the Serchio River during dry periods.
  - Decrease salinity in the lake and maintain water level
- Establish vegetation buffer strips along canals in 2 areas with different soils.
- Lead water through retention basin
- Change crops in parts of the fields

Measures to reduce runoff from fields, to canals and the lake







- natural water pockets within the engineered network
- possibilities for water buffering/ treatment on site
- ecological valuable areas for specific species

The Pyrenees; NBS against rockfall release

Most efficient for preventing release

Use of local wood, - avoid long transport or heavy machinery.

The Case study site at Portalet Artouste (Pyrenees-France)

The steep slope along the portalet Artouste road is regularly affected by rockfall, falling onto the road and causing damages and loss of lives. Log frames combined with forest management have been considered to reduce the rockfall risk.

Santa Elena – Preventing rockfall with vegetated terraces

The case study site at Portalet Santa Elena (Pyrenees-Spain)

The international road connecting the French and Spanish sides of the Pyrenees is vulnerable to natural hazards. The till slope is prone to erosion and landslides that can cause traffic accidents and damages to the main road. Vegetated terraced slopes have been considered to reduce the soil erosion and the effective slope steepness.

Example from Biescas Spain, of >100 year old terrassed and vegetated slope. Has worked since 1905 and is today not visible.

Bastan Capet - aforestation against avalanche release

The case study site at Bastan Capet (Pyrenees-France)

The forest of Capet has been devastated several times by snow avalanches that have reached the touristic village of Barèges, causing extensive damages. Afforestation with tripods has been proposed.

Plants protected by wooden tripods until they are 4-5 m high

Village of Barége at the bottom of the avalanche path

Challenges! –relevant for other NBS projects also?

- The main challenges to the project are delays in implementation of the NBSs, leading to loss of time for monitoring their effects. These delays are caused primarily by:
  - The tendering process for procurement of goods and services; often not straightforward, complaints from bidders, etc.
  - Local politics and bureaucracy; revision of land use plans, local elections, etc.
  - Land owners resisting use of their land, for various reasons:
    - Loss of agricultural land
    - General scepticism to NBS, or lack of knowledge
    - Economic reasons; want land compensation, loose extra income from gravel out-take,
    - Other, hidden agendas and see an opportunity in the NBS plans

Lessons learned from the challenges

- Plan well ahead. Getting plans through to practical implementation takes more time than one possibly could think of.
- Bring stakeholders into the process as early as possible, if possible from scratch; co-creation and co-design of the measures establishes ‘ownership’ and increased enthusiasm.
- Use their local knowledge wherever possible and show appreciation.
- Identify potentially ‘problematic’ stakeholders and plan strategies to handle these.
- If at all possible, choose public land for your NBSs.
- Identify individuals who can be good ambassadors for the project and work closely with them.
- Procurement can be time consuming. Be as detailed as possible in the tender documents. Complaints will lead to serious delays.

Final remarks

- Most of the measures can be characterized as hybrid solutions, with varying mixed between engineered and true natural measures
- NBS projects which involve monitoring of effects, need long time, as the implementation phase may take long!
  - PHUSICOS is now applying for a 1 year extension, to 5 years.
- Despite challenges, the PHUSICOS measures are well underway, and there are still a few more to be proposed.
- Monitoring should continue also ‘post-PHUSICOS’!
- NB! Until now, Measures to reduce risk from flooding, avalanches, erosion/rockfall and runoff with pollution. No real landslide measures yet.
  - **A dataplatform for NBS is also established, and we invite input on examples of NBS to reduce landslide risk**

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Thank you!

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