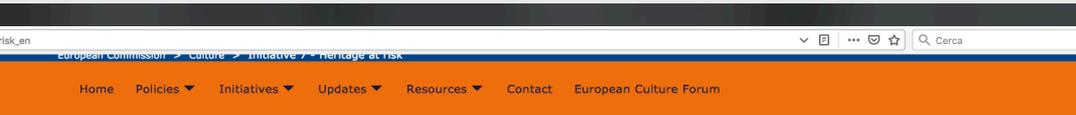


# Strengthening resilience of Cultural Heritage at risk in an extreme changing environment

*Alessandra Bonazza, Alessandro Sardella, Paola De Nuntiis,  
Elisa Palazzi and Jost von Hardenberg  
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# CULTURAL HERITAGE AT RISK



## Initiative 7 - Heritage at risk

Overview

Initiative 1 - Shared heritage

Initiative 2 - Heritage at school

Initiative 3 - Youth for heritage

Initiative 4 - Heritage in transition

Initiative 5 - Tourism and heritage

Initiative 6 - Cherishing heritage

**Initiative 7 - Heritage at risk**

Initiative 8 - Heritage-related skills

Initiative 9 - All for heritage

Initiative 10 - Science for heritage

International dimension of the European Year of Cultural Heritage 2018



### Why?

The European Year of Cultural Heritage aims to strengthen initiatives designed to prevent the illicit trafficking of cultural goods. This is being achieved by enhancing cooperation on risk management on the one hand, and raising awareness about the implications of illicit trade in cultural goods on the other – both within and outside of the EU.

### For whom?

National authorities competent for heritage protection, policymakers, enforcement authorities, art market, research communities.

### What?

The initiative has 3 components:

#### Component 1: Adoption of regulatory measures

The adoption of a regulation on the import of cultural goods into the EU will strengthen Europe's ability to combat the illicit trade in cultural goods.

- *Prevention*
- *Adaptation*
- *Mitigation*

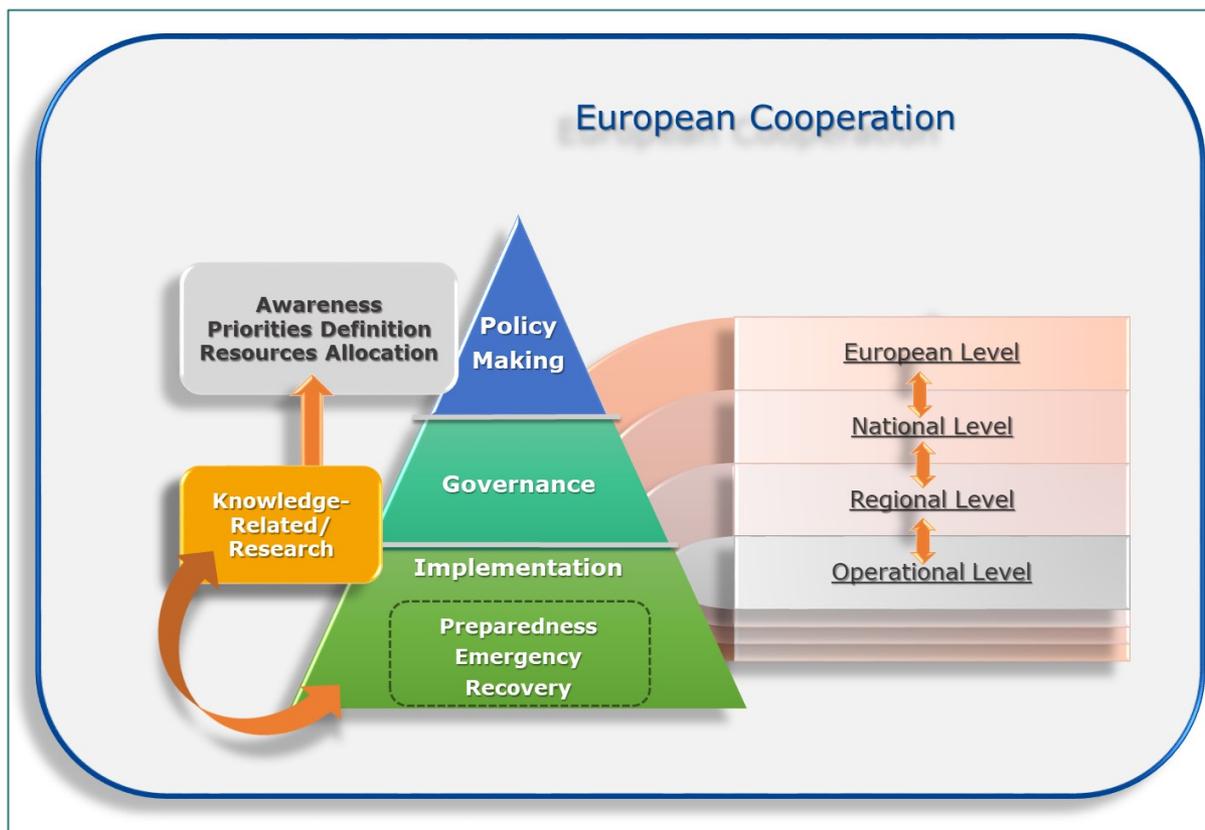


ansa.it

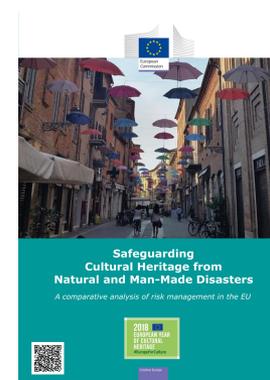


## Decision making from policy to practical application

*To maximise synergies between the political, administrative and operational levels in the field of disaster awareness an integrated approach is required.*



*Capitalisation of results/optimisation of resources/efficient communication flow*



<https://publications.europa.eu/>



# GUARDING HERITAGE FROM NATURAL HAZARDS



Climate change and other natural hazards pose a risk for cultural heritage assets and the people around them. ProteCHt2save is a project that works to protect the heritage and nearby populations - especially against the risk of floods. ProteCHt2save produces tools to help local officials manage risks and develop action plans for emergencies.

[www.interreg-central.eu/culture](http://www.interreg-central.eu/culture)



AUSTRIA	Niederösterreich
CROATIA	Jadranska Hrvatska
CZECH REPUBLIC	Praha
HUNGARY	Dél-Dunántúl
ITALY	Emilia-Romagna
POLAND	Śląskie
SLOVENIA	Vzhodna Slovenija



PROJECT BUDGET  
**2.15**  
MILLION €

ERDF FUNDING  
**1.79**  
MILLION €

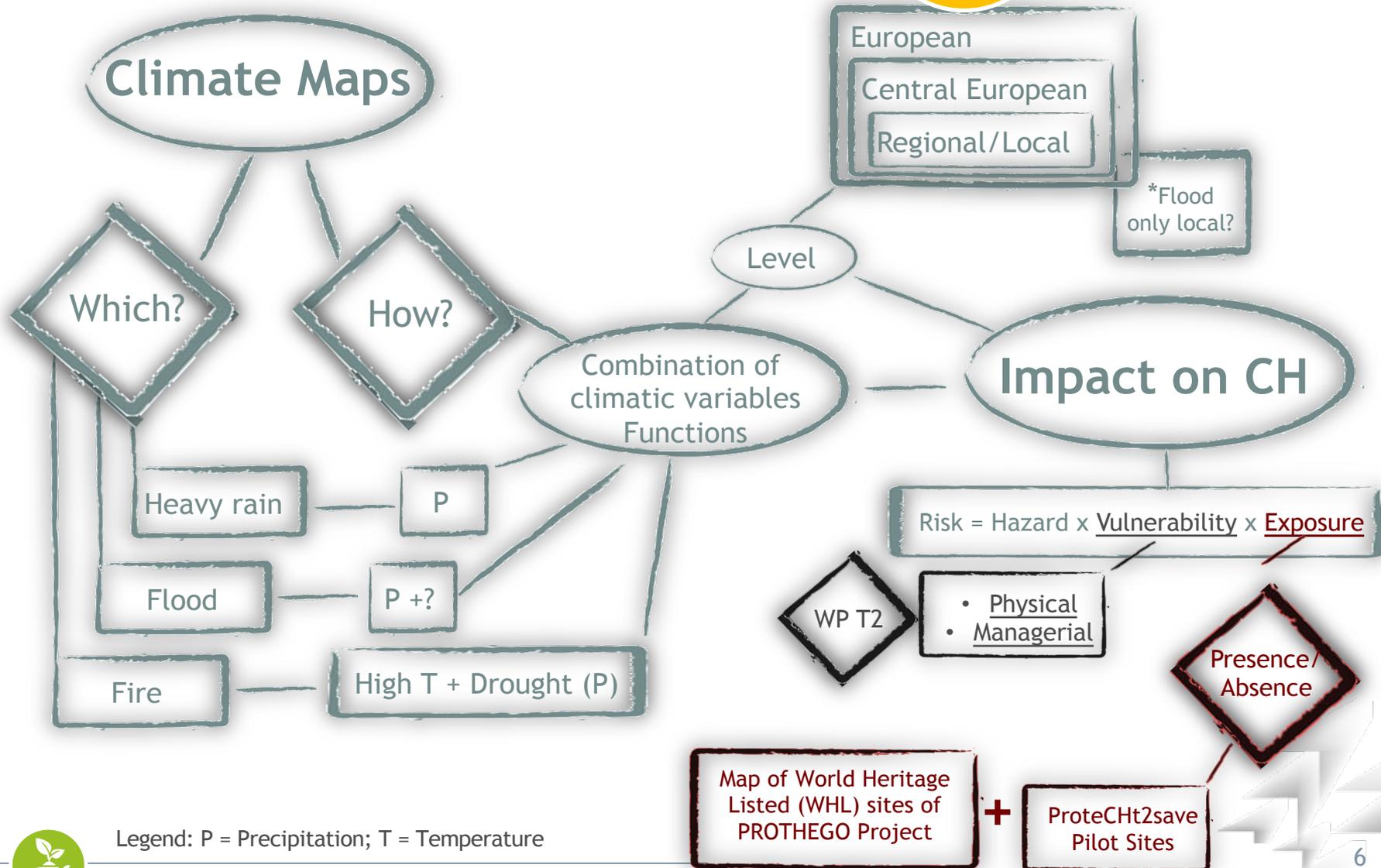
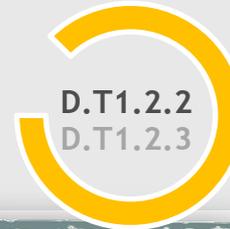
# PROJECT STRUCTURE



photos: Miloš Drdáký, Danube University Krems, Mein Bezirk



# Development of map creator tool



\*Flood only local?

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability} \times \text{Exposure}$$

- Physical
- Managerial

Map of World Heritage Listed (WHL) sites of PROTHEGO Project

ProteCHt2save Pilot Sites



Legend: P = Precipitation; T = Temperature

(Files formats, readable by GIS: wms; shp; Google Earth)

## CLIMATE DATA, DOWNSCALING AND ANALYSIS TOOLS

### General Framework

**Regional Climate Models (RCMs)**

10-50 km

Downscaling

**Bias correction**

**Statistic/Stochastic Downscaling**

1 km

### ProteCht2save

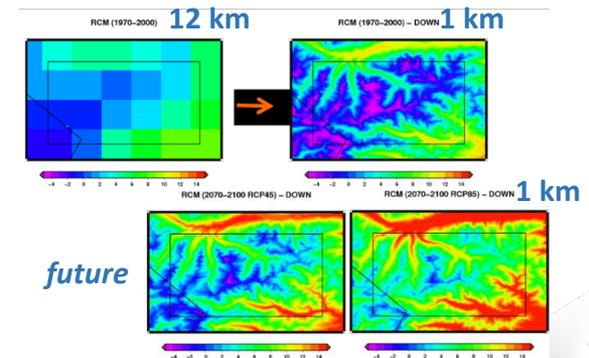
**Euro-CORDEX** (Coordinated Downscaling Experiment - European Domain) RCMs

- **0.11° lat-lon resolution (~12 km)**
- **Historical and future simulations**
- **Two future scenarios (RCP4.5 and RCP8.5)**



**Station based reference dataset E-OBS (25 km)**, used for correcting the temperature and precipitation provided by the RCMs.

Use of the **RainFARM** downscaling technique: **temperature and precipitation downscaling with orographic correction**

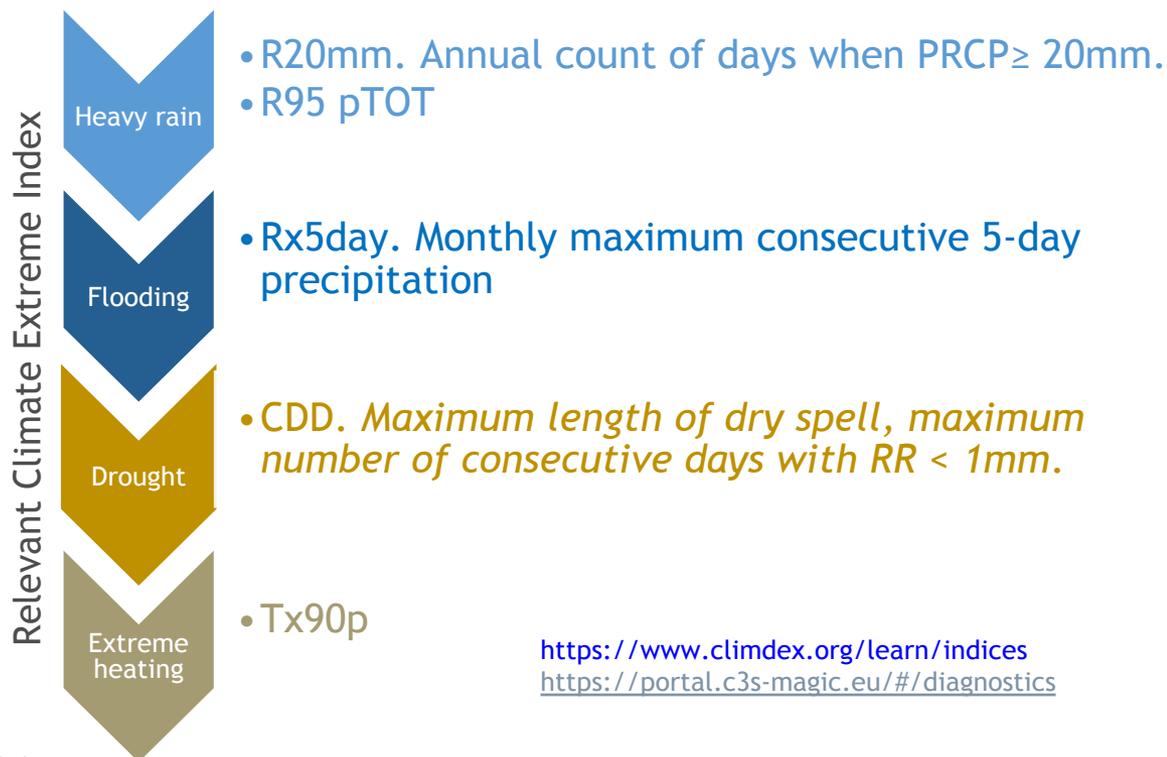


D.T1.2.2  
D.T1.2.3

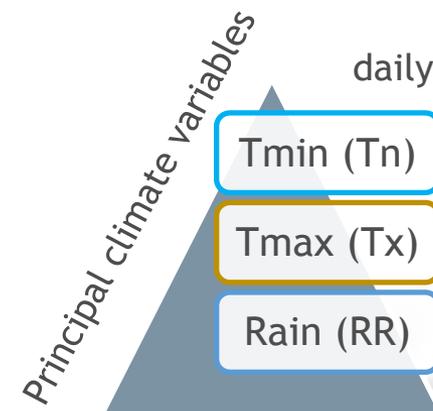


## CLIMATE EXTREMES AND METRICS

*Indexes selected to evaluate statistics of extreme events for temperature and precipitation and to compare with observed extremes*



<https://www.climdex.org/learn/indices>  
<https://portal.c3s-magic.eu/#/diagnostics>



# Elaboration of maps with hot spots of extreme potential impacts on CH

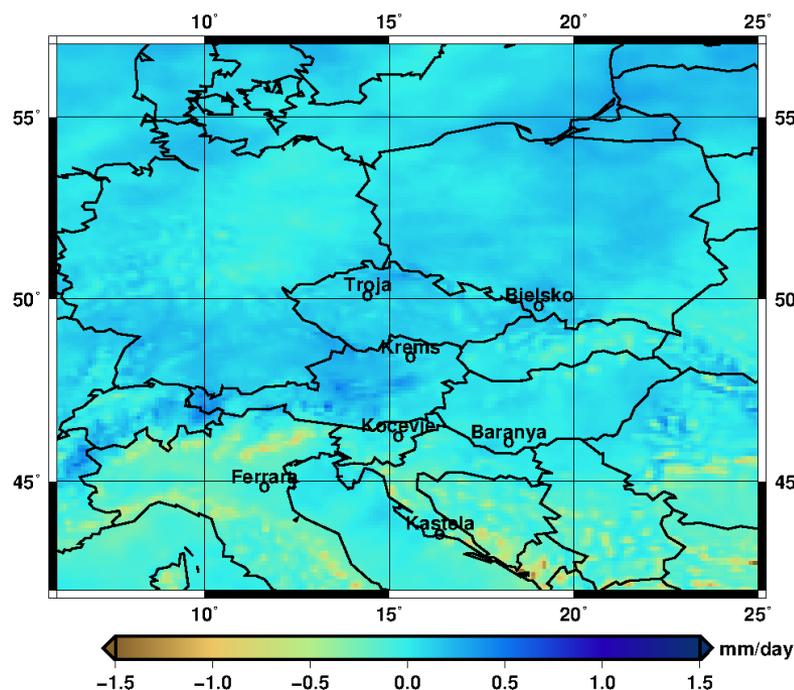


## Changes in precipitation in (2071-2100) wrt (1976-2005) in Central Europe

### RCP 4.5

Data source: RCA4 RCM (Euro-CORDEX)

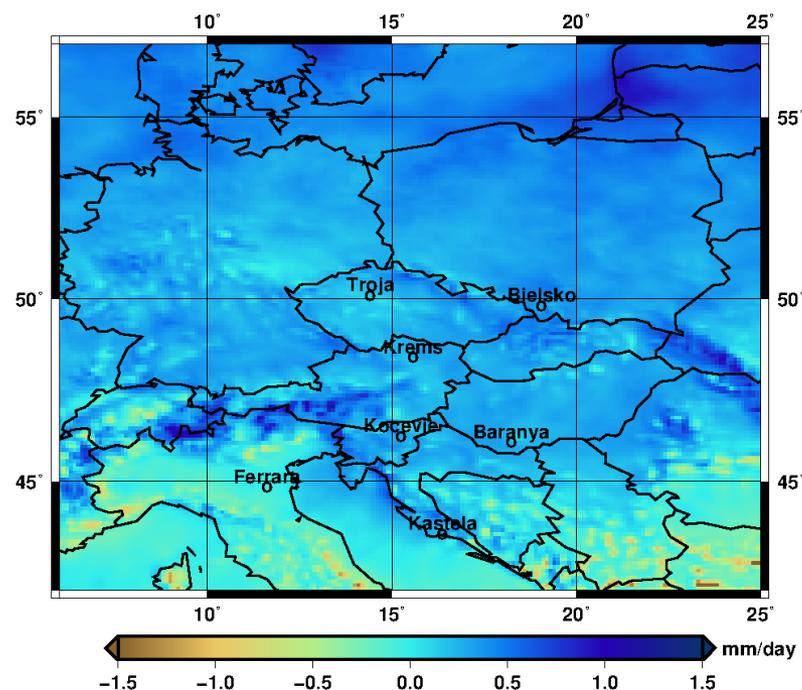
MPI-ESM-LR-RCA4 RR [2071-2100]-[1976-2005] RCP4.5



### RCP 8.5

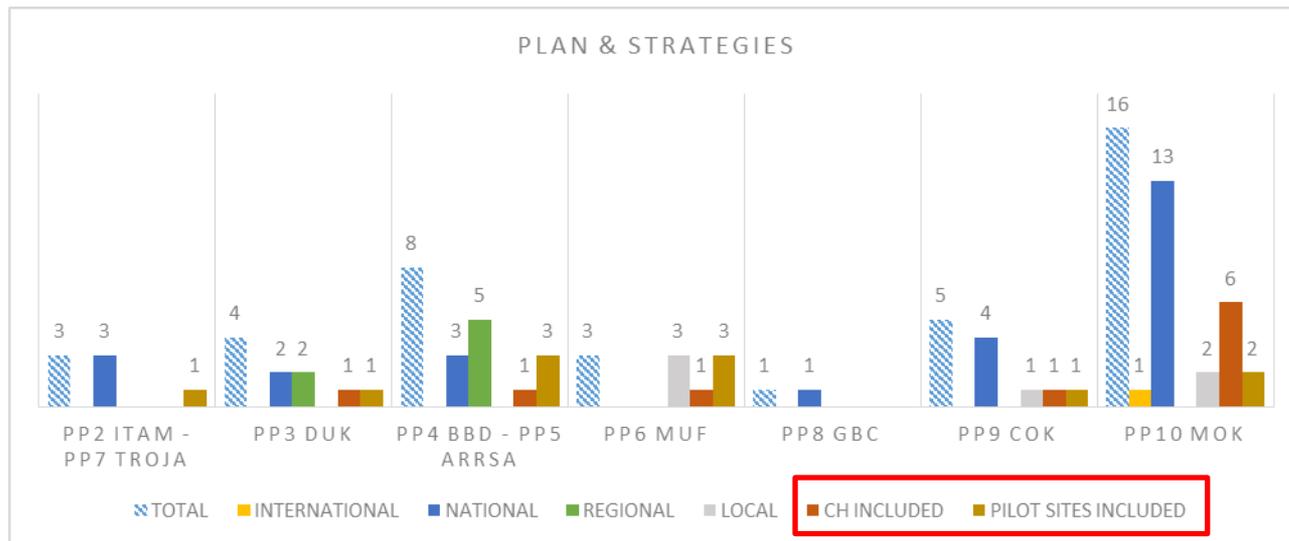
Data source: RCA4 RCM (Euro-CORDEX)

MPI-ESM-LR-RCA4 RR [2071-2100]-[1976-2005] RCP8.5

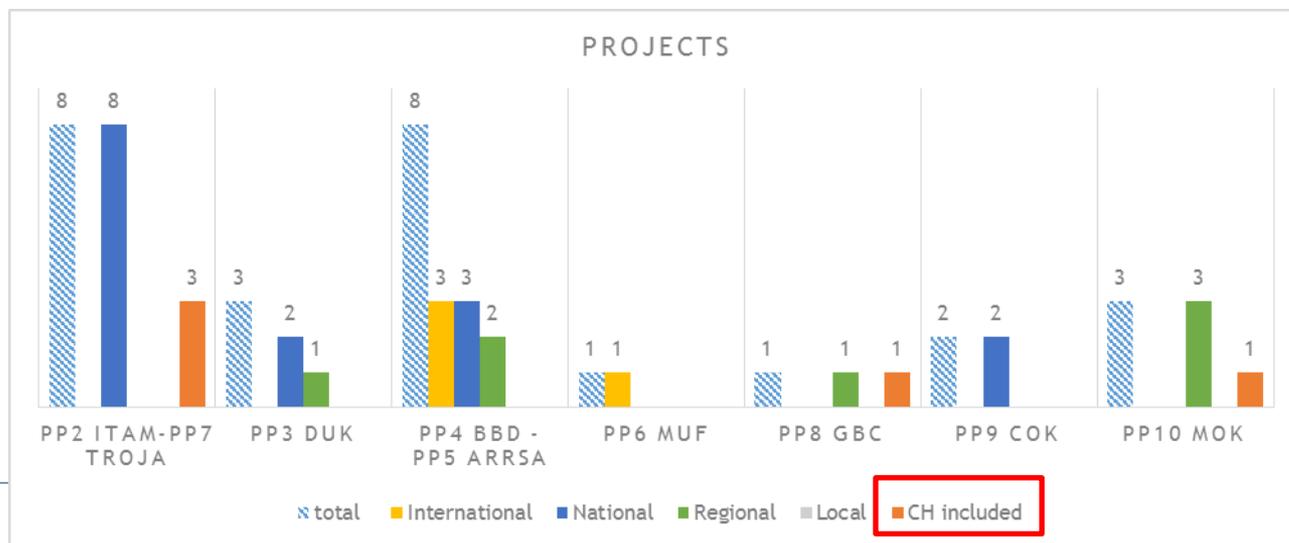


#### Plan & strategies

The number of plans and strategies including ProteCHt2save pilot sites are highlighted as well as those taking into consideration built heritage (Bielsko-Biala, Ferrara, Kastela and Kocevje)



Protection and recovery of built CH almost not included



# WP T1 IDENTIFICATION OF RISK AREAS AND PRIORITIES

## Activity A.T1.1

D.T1.1.2 Report including and inventory of existing tools for risk evaluation

### Plan & strategies

The number of plans and strategies including ProteCHt2save pilot sites are highlighted as well as those taking into consideration built heritage (Bielsko-Biala, Ferrara, ...)

Protection and recovery of built CH almost not included

Protection and recovery of built CH almost not included

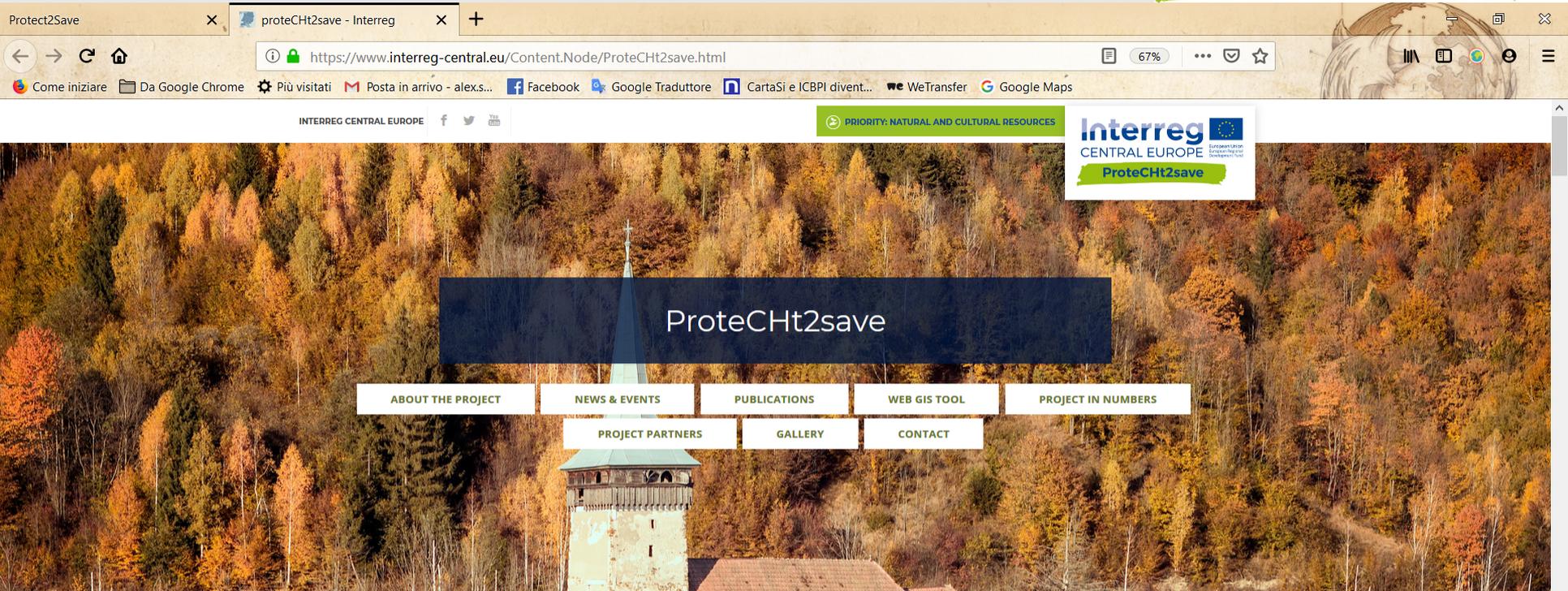


Managerial Vulnerability

Implementation



# PROTECHT2SAVE WEB GIS TOOL FOR RISK MAPPING



## RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF CULTURAL HERITAGE IN CHANGING ENVIRONMENT

Disasters and catastrophes pose risks not only to the conservation of cultural heritage assets with its cultural, historic and artistic values, but also to the safety of visitors, staff and local communities. Additionally, they cause undoubtedly negative consequences for the local economies.

### Activities

The **ProteCHt2save** project contributes to an improvement of capacities of

## Main expected results

**ProteCHt2save** will deliver ICT solutions (web-based inventory and maps) and tools (decision support tool, best practices manual, handbook on transnational rescue procedures) for risk management and protection of cultural heritage in central Europe. Pilot actions will test the approach and tools in risk prone areas and areas with cultural heritage vulnerabilities to improve the existing disaster risk management plans and policies in municipalities.



# PROTECHT2SAVE WEB GIS TOOL FOR RISK MAPPING

Introduction

Map filters <

## Map filters

Risk index

r95pTOT

Scenarios

MODELS

Model

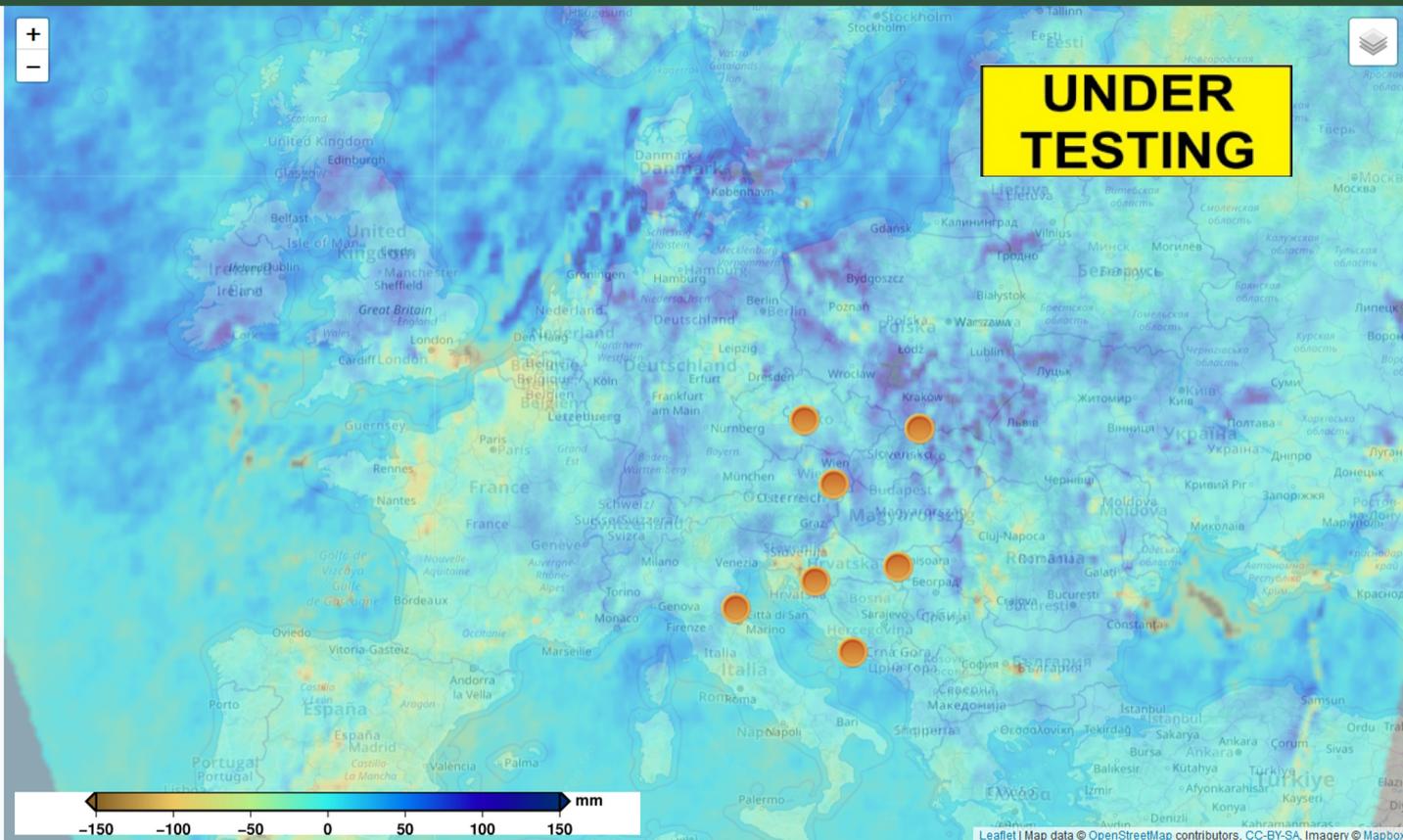
EC-EARTH\_HIRAM5

Map

r95p\_ICHEC-EC-EARTH-DMI-HIRHAM5\_

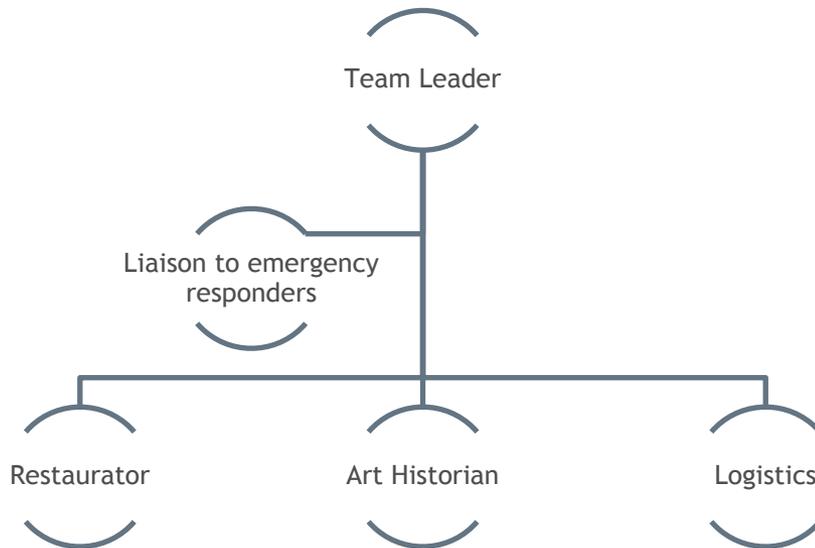
Opacity

0.5



*Designed to support regional and local authorities to prepare measures and evacuation plans in case of emergencies for building resilience of cultural heritage to extreme events linked to climate change*

# CULTURAL HERITAGE RESCUE TEAM

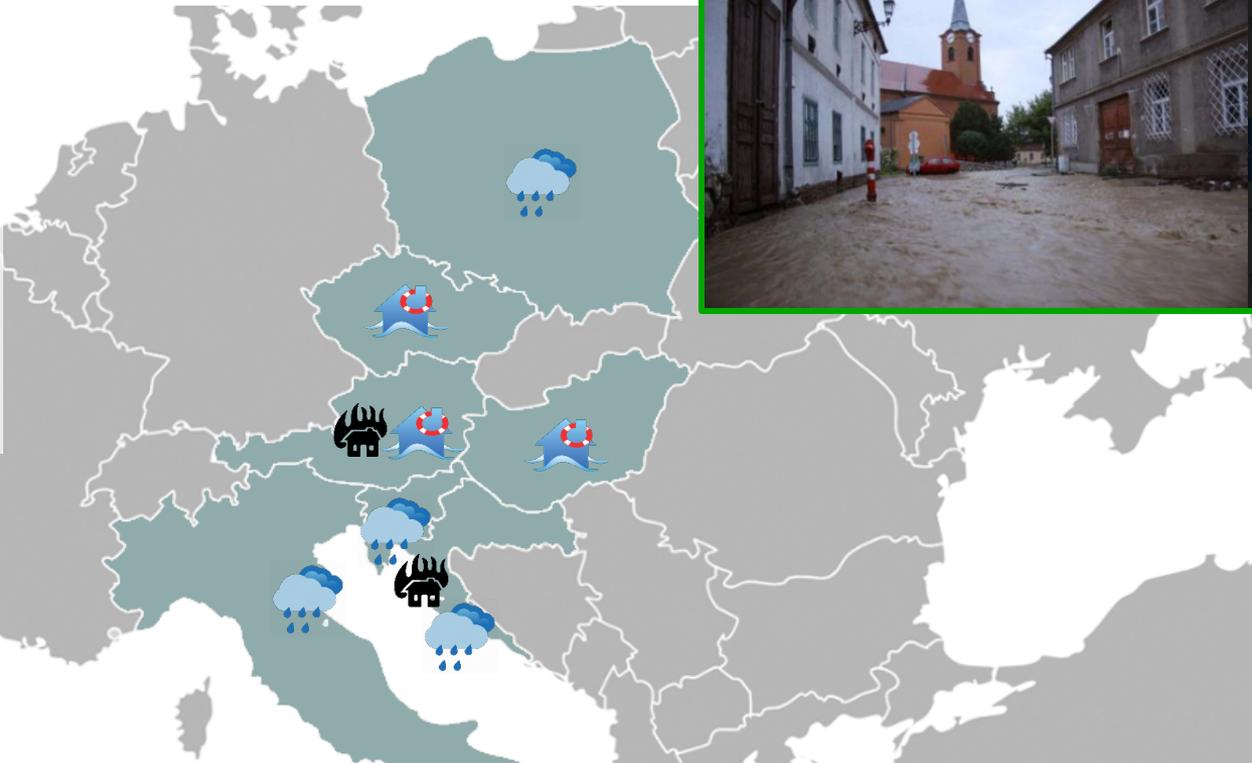


# WPT4 PILOT SITES

7 pilot actions will be conducted linked to climate change and variability associated with hydrometeorological and climate extremes

Monumental Complexes/Museums

Preparedness strategies  
Evacuation in emergency



-  Flood events in large basin
-  Fire due to drought
-  Extreme events of heavy rain



# INTEGRATED WEBGIS TOOL FOR DECISION MAKING IN THE MANAGEMENT OF HERITAGE AT RISK

## Objective

To develop a WebGIS tool for supporting Public Authorities and private organizations in the decision making process for safeguarding CH at risk in changing climate

## Based on

Online tool for risk maps production implemented in the **Interreg CE Project ProteCHt2save**

## Using

Main Outcomes of:

- **FP6 Noah's Ark**
- **Interreg CE RUINS, HiCAPS and BhENEFIT**
- **H2020 HERACLES and SHELTER.**



## Integrating

- **Risk assessment on CH due to flash flood, windstorm and landslides**
- **Protection of additional cultural categories (cultural landscapes, historic parks, archaeological sites and small ruined villages in mountain and coastal areas)**
- **WebGIS tool with satellite data and products from the Copernicus programme**





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THANK YOU

