



DELIVERABLE D.T1.3.2

Finalization of the WebGIS Tool for
decision making in the management of
heritage at risk.

Version 01
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With the contribution of all partners





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1. Introduction

This document illustrates the results of the activities performed in the Thematic Work Package T 1 - Integrated WebGIS tool for decision making in the management of heritage at risk - and represents one of the final steps to reach the objective of the output O.T1.3 - WebGIS tool for multi-risk assessment on cultural heritage in Central Europe.

The WebGIS tool (WGT) - “Risk mapping tool for Cultural Heritage protection” - has been developed on the basis of outputs deriving from of A.T1.1 and A.T1.2 by upgrading the on line tool developed in ProteCHt2save (O.T1.2) and optimizing results from RUINS, HiCAPS, BhENEFIT, Heracles and SHELTER.

The WGT has been designed in order to guarantee additional applications and further upgrade.

This deliverable describes the upgraded and final version of the WGT, including information on the new STRENCH case studies and new map tools to visualize climate maps and download data (D.T1.1.2 - Exploring Copernicus programme for safeguarding Cultural Heritage at risk and in D.T1.1.3 - Scenarios of impact of extreme climate conditions in Central Europe). In addition, the WGT has been implemented with the inclusion of the vulnerability rate (D.T1.2.2 - Definition of a methodology for ranking vulnerability of cultural heritage).

Detailed instructions for using the WGT practically are reported in the Deliverable D.T1.3.3 - Tutorial development for user friendly transfer of the WebGis tool.

Note:

Vers. 02 - Updates have been made compared to the previous version (06-2021) following the user's feedback after the Testing Activities carried out for the implementation of D.T2.2.1 and D.T.2.2.2.



2. Risk mapping tool for cultural heritage protection

2.1. General overview

The “Risk Mapping tool for cultural heritage protection” (WGT) grafted into the Web GIS tool implemented in the framework of the Interreg Central Europe project “ProteCHt2save - Risk assessment and sustainable protection of cultural heritage in changing environment”, completed in June 2020 and geared towards policy and decision makers in support of the identification of risk areas and vulnerabilities for cultural heritage in Central Europe exposed to extreme events linked to climate change.

The WGT includes the outputs and results from ProteCHt2save activities regarding the identification of the critical elements and vulnerability in the resilience and risk management of cultural heritage, comprising climate risk maps with projections in the near and far future.

During STRENCH implementation the WGT has been revised and upgraded by integration with:

- Climate extreme indices, elaborating new ones in order to cover a higher range of hazards mainly linked to temperature and precipitation (A.T1.1): flash flood, windstorm, landslides, heavy rain, flood events in large basin, fire due to drought periods.
- Application of satellite datasets for the elaboration of selected indices at seasonal time scale (A.T1.1).
- New case studies and harmonization with the existing ones (A.T2.2). The new categories of cultural heritage included are cultural landscapes, historic parks, archaeological sites and small ruined villages in mountain and coastal areas.
- A methodology for vulnerability ranking and the rate of vulnerability of the case studies by including new cultural heritage categories and hazards in order to achieve the objectives foreseen in STRENCH (A.T1.2).

The updated WGT is specifically implemented in order to support the production of strategies for cultural heritage protection to be integrated into plans for Disasters Risk Reduction in line with the 4 Priorities of the Sendai Framework for Disaster Risk Reduction 2015-2030.

In this framework the WGT propose ready-to-use solutions such as climate hazard maps and methodology for vulnerability ranking of cultural heritage, including landscape. The new-fangled WGT for Risk Mapping provides also hazard maps generated applying satellite services, measure-oriented database on the criticalities of CH and intervention priorities to strength resilience to disasters. Specifically, the use of Copernicus services and its integration in the WGT constitute a notable innovation that will deliver a direct impact to the management of natural and cultural heritage sites, with high potentiality to be scalable to new sectors under threat by climate change.

It is possible visualize the WGT from the official web site of both Projects clicking on the Web GIS Tool button or by the link: <https://www.protecht2save-wgt.eu/>

Detailed information about the first implementation of the ProteCHt2save WeGIS Tool for Risk Mapping is available in the ProteCHt2save Deliverable D.T1.2.2 (Development of map creator online tool) downloadable from the ProteCHt2save web site.

In the STRENCH Deliverable D.T1.3.1 “Tailoring ProteCHt2save on line tool for further implementation” are reported the main changes applied on the ProteCHt2save Web GIS according to the objectives of STRENCH project. Detailed information on the different sections and instruction of the WGT use and application are given in the STRENCH Deliverable D.T1.3.3 “Tutorial development for user friendly transfer of the Web GIS tool”.

The WGT finalization aimed to allow possible future updates and integration with further heritage categories and hazard, in addition to other tools for cultural heritage protection.

It is foreseen its testing in WPT2 for landscape and ruined hamlets protection (Deliverables D.T2.2.1 and D.T2.2.2) in collaboration with all PPs of STRENCH project. This activity is addressed to identify points of strengths and weakness in the applicability and identify possible improvements.

Next sections are dedicated to a brief description and major features of the structure and contents of the on line service (WGT) finalized in STRENCH project.

The web page of Web GIS Tool (WGT) for Risk Mapping is composed of 7 pages and only the Home Page is immediately available for all users, while a registration is required for the access at the further contents and pages.

2.2. The Home page

On the Home page we can find in brief, general information of the project and the introduction to the Web GIS Tool for risk mapping. Furthermore, a first overview of the project pilot sites is also available. Clicking on each of these frames we can obtain more detailed information on the partner responsible for the pilot site. Registration is required for consulting the overall contents

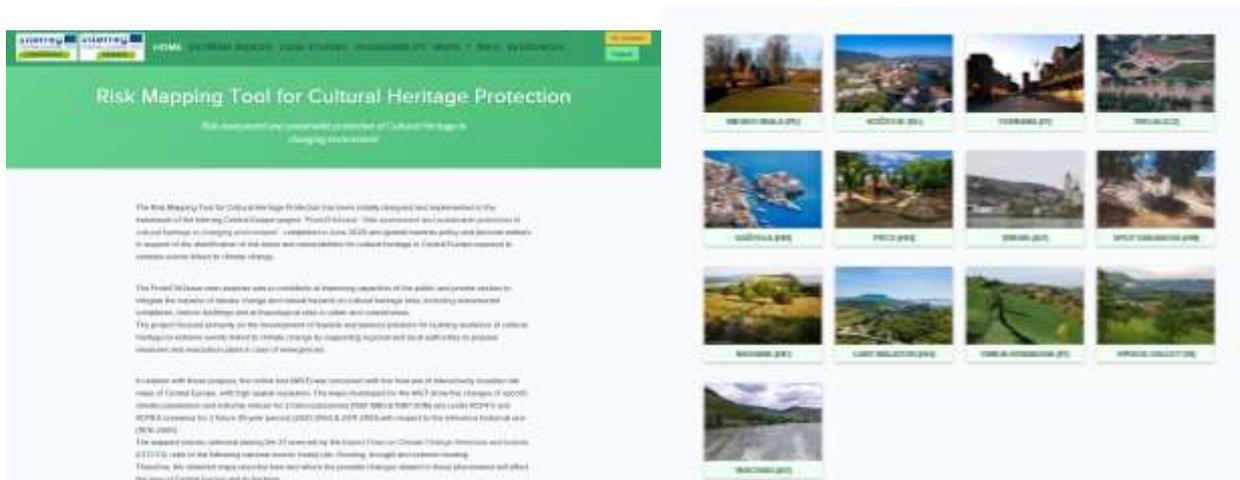


Figure 1. Two screen shoot of the Web GIS Tool showing a general view of the Home page.

The page is designed and set to modify/integrate the information/content and to host other additional case studies.

2.3. The Climate extreme indices

The EXTREME INDICES page is important to have deeper information about the climate extreme indices and variables selected for the project. These indices are internationally accepted by the scientific community for representing change in climate extreme, such dry spell or intense precipitation.

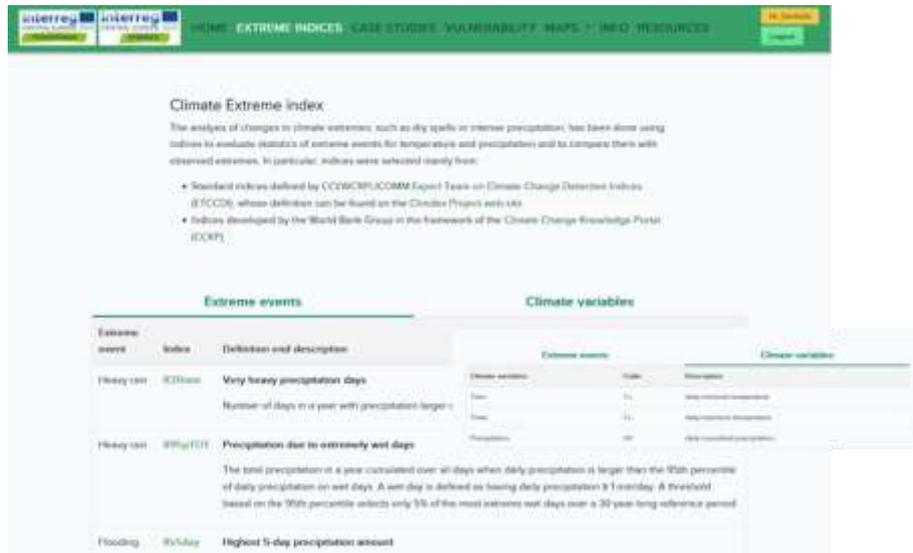


Figure 2. Screen shoot of the page EXTREME INDICES

Clicking on each short name of the indices it is possible to reach the original web page where it is possible to obtain deeper information about each climate risk index to better understand its meaning. In the same page we can also visualize the climate variables.

The page is set to be integrated with additional climate indices linked to a specific natural hazard caused by intense precipitation and/or change in temperature.

2.4. Case studies

This section of the Web GIS Tool for Risk Mapping hosts the introduction to the pilot sites participating in both the projects ProteCH2save and STRENCH, indicating their role in either projects and illustrating carried out as well foreseen activities aimed at bolstering local existing measures for the protection of cultural heritage against natural hazards.

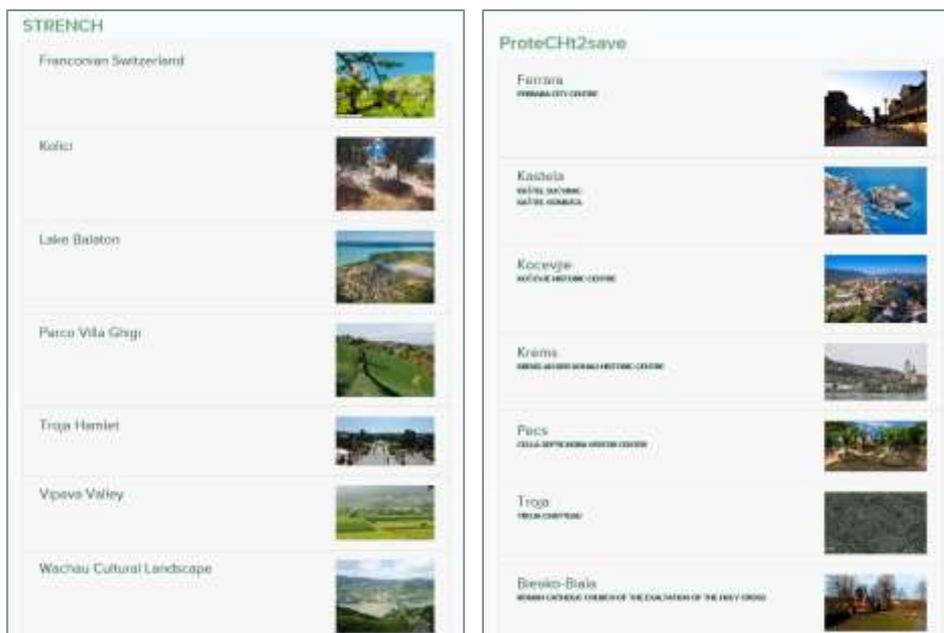


Figure 3. Screen shoot of the page “CASE STUDIES” showing detailed cards containing information on each case study.



The page is set to be integrated with additional case studies linked to a specific natural hazard caused by intense precipitation and/or change in temperature.

2.5. Vulnerability

On the vulnerability page the methodology for the assessment of the vulnerability developed in both projects ProteCH2save and STRENCH is reported (Fig. 4). The information in this section merge results from the ProteCH2save Deliverable D.T2.1.3 (Decision Support Tool) and results from the STRENCH Deliverables D.T2.1.1 (Criticalities of CH landscapes for landslides, flash floods, wind storms and fire) and D.T1.2.2. (Definition of a methodology for ranking vulnerability of cultural heritage).

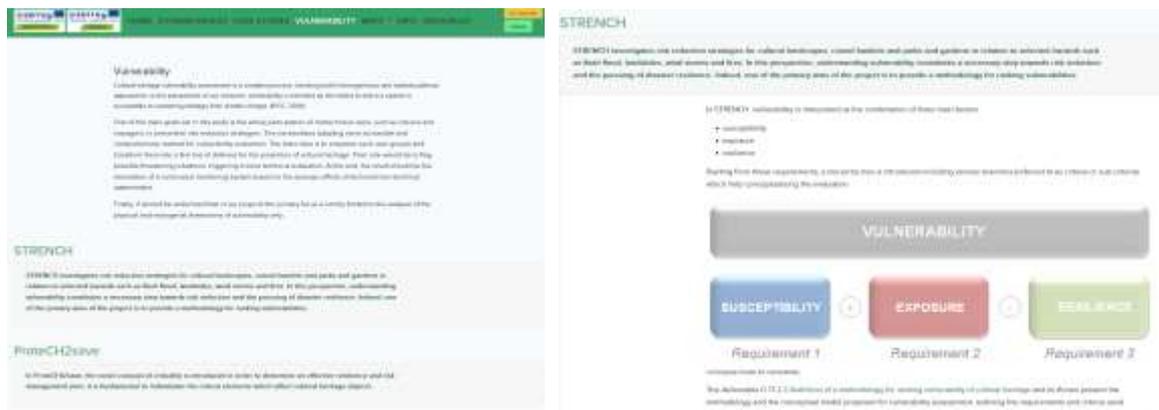


Figure 4. Screenshot of the page “VULNERABILITY” showing the two boxes related to the methodology for the assessment of vulnerability developed in both project ProteCH2save and STRENCH (left) and the preview of the content that appear clicking on the box related to STRENCH project (right). The same will be clicking on the ProteCH2save box.

In each box, the preliminary results related to the assessment of the vulnerability carried out at the case studies are also reported. Furthermore, the possibility to download the pdf of the vulnerability assessment has been implemented for each case study (Fig. 5).

File Site	Ranking of vulnerability	Download	Case study	Ranking of vulnerability				
				R00	R02	R03	Vulnerability	
TROJAS-CHATEAU (CZ)	PC1 Flood F3- Structures susceptible to partial damage due to flooding	pdf	WACHAU (AT)	0.22	0.08	0.03	0.33	pdf
			Dumbrava (RO)	0.23	0.01	0.48	0.28	pdf
			Kozulj (SI)	0.23	0.21	0.03	0.31	pdf
BEOGO BRANA (PL) - Szwedów Church	PC2 Fire due to drought F3- Fire destroyable structures and buildings in countryside PC4 Heavy rain R5- Structures and elements partly exposed to rain and/or moderate riverbank runoff	pdf	FRANZISKA (CZ)	0.33	0.08	0.16	0.23	pdf
			KOLIC (HR)	0.34	0.48	0.2	0.40	pdf
			FRANCISKA (CZ)	0.35	0.44	0.41	0.31	pdf
BREMEN (DE)	PC1 Flood F3- Structures susceptible to partial damage due to flooding	pdf	Wachau (AT)	0.24	0.15	0.08	0.31	pdf
			LINE (VALENTIN) (RO)	0.33	0.08	0.07	0.28	pdf
			VALA (UNGAR) (IT)	0.48	0.08	0.01	0.39	pdf
PECS ZSOLNAY MUSEUM (HU)	PC4 Heavy rain R3- Complex stone structures and elements with horizontal surfaces PC1 Flood F3- Structures made of materials with a high volumetric change due to moisture	pdf	WACHAU (AT)	0.28	0.08	0.17	0.31	pdf
			Vajna (Szerdahely) (HU)	0.2	0.48	0.17	0.36	pdf
			Havas (Munkacs) (HU)	0.23	0.36	0.44	0.36	pdf
KOCEVJE (SLOVAKIA) (SK)	PC4 Heavy rain R5- Structures and elements partly exposed to rain and/or moderate riverbank runoff	pdf	Havas (Munkacs) (HU)	0.14	0.34	0.07	0.1	pdf
			Berdo, Church of St. Miklos and Ferenc	0.16	0.04	0.08	0.02	pdf
			Berdo (Slovak)	0.2	0.08	0.01	0.1	pdf
FERENC (GART) (HU) - ESTERSE (HU)	PC4 Heavy rain R5- Structures and elements partly exposed to rain and/or moderate riverbank runoff	pdf						
KASTELJA KASTE - GOMLJICA (HR)	PC1 Flood F3- Flood resistant structures and buildings PC4 Heavy rain R2- Structures and elements exposed to rain and/or heavy riverbank runoff	pdf						

Figure 5. The screen shoot illustrating the preview of the vulnerability assessment carried out at the case studies of both projects ProteCH2save (left) and STRENCH (right).

2.6. Maps

The online tools for maps creator are available clicking on the page named “MAPS”. This page has been re-designed and implemented and offers the possibility to investigate among three different map tools (Fig. 6):

- Climate modelling
- Earth observation
- Open search

Detailed information and indication about the use of these tools is reported in the tutorial of the WGT (Deliverable D.T1.3.3).



Figure 6. Screen shoot showing the three different tools developed for create and download maps and time series.

2.6.1. Common features of the map tools.

The three tools present some common features immediately visible once each of them is opened:

- The INFO button, located in the top-left corner of each tool and permits to have information on the methodology and procedures applied to develop the selected tool.
- The map/data setting box, on the left side (area included in the blue box in figures 7, 8 and 9) allows the user to set the parameters and customize some feature of the map before and after the visualization.
- The map/data visualization area, on the right side of the screen (area included in the yellow box in figure 7, 8 and 9) allow the user to visualize the created map after setting option. In this area there is also the possibility to zoom in/out and change the base map.

2.6.2. Climate modelling tool.

The climate modelling mapping tool is related to the possibility to create maps investigating within the historic and future projection of selected extreme climate indices and variables elaborated using climate models. Detail on the methodology is available after clicking on the Info button of the tool.

Detailed information and indication about the use of this tool is reported in the tutorial of the WGT (Deliverable D.T1.3.3).



Figure 7. Screen shot of the introductory page related to “CLIMATE MODELLING” MAPS tool.

2.6.3. Earth Observation tool

The earth observation mapping tool allow the user to create climate maps referred to the selected extreme climate indices and variable elaborate at season time scale using satellite data from Copernicus ERA5 and NASA GPM IMERG datasets. Detail on the methodology is available after clicking on the Info button of the tool.

Detailed information and indication about the use of this tool is reported in the tutorial of the WGT (Deliverable D.T1.3.3).

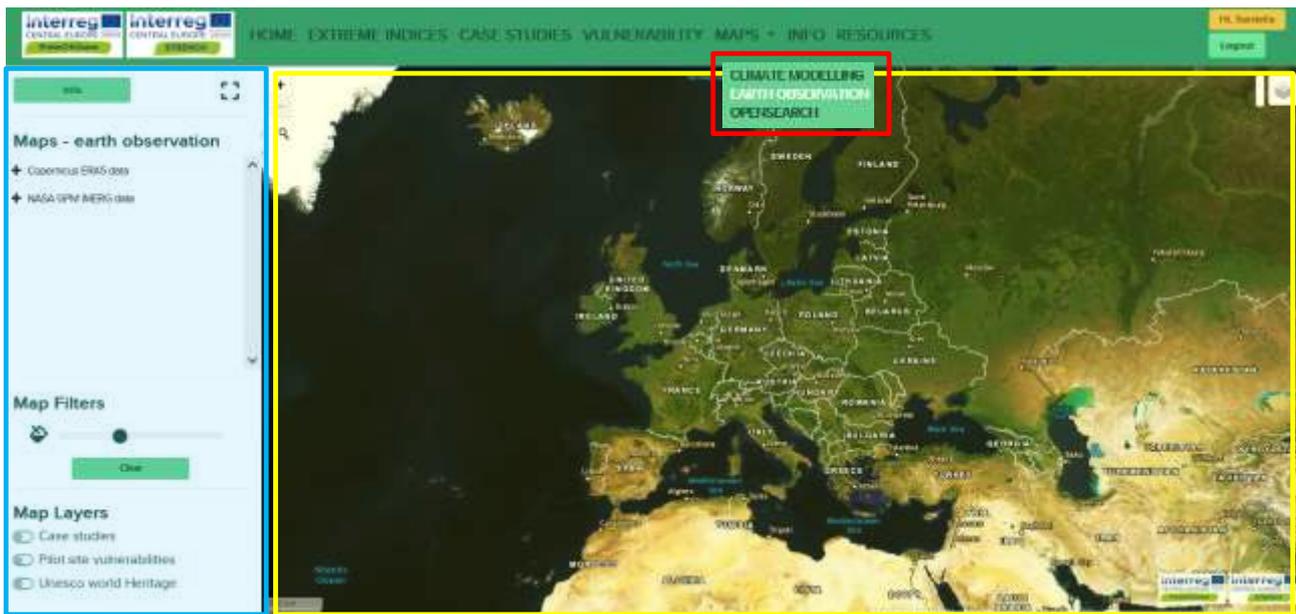


Figure 8. Screen shot of the introductory page related to “EARTH OBSERVATION” MAPS tool.

2.6.4. Open search tool

It deals with a search feature that allows access to a wide database of earth observation data developed by SISTEMA gmbh (<https://www.sistema.at>) and currently used for the elaboration of the maps that will be uploaded in the “EARTH OBSERVATION” tool. This tool, gives the possibility to query the database independently by choosing the extension of the area of interest directly on the map or even just the position based on geographical coordinates. Once the point / area of interest has been identified, it will be possible to choose the climate index and the time period of interest. The final output can therefore be, depending on the choices, a numeric data (e.g. a time series of values on a specific point in a readable file format, such as csv), a colour scale map or a numerical matrix. All information acquired with the "OPENSEARCH" tool is always be geocoded. The purpose is to allow a specific analysis of the climate indices by the stakeholders.

Detailed information and indication about the use of this tool is reported in the tutorial of the WGT (Deliverable D.T1.3.3).

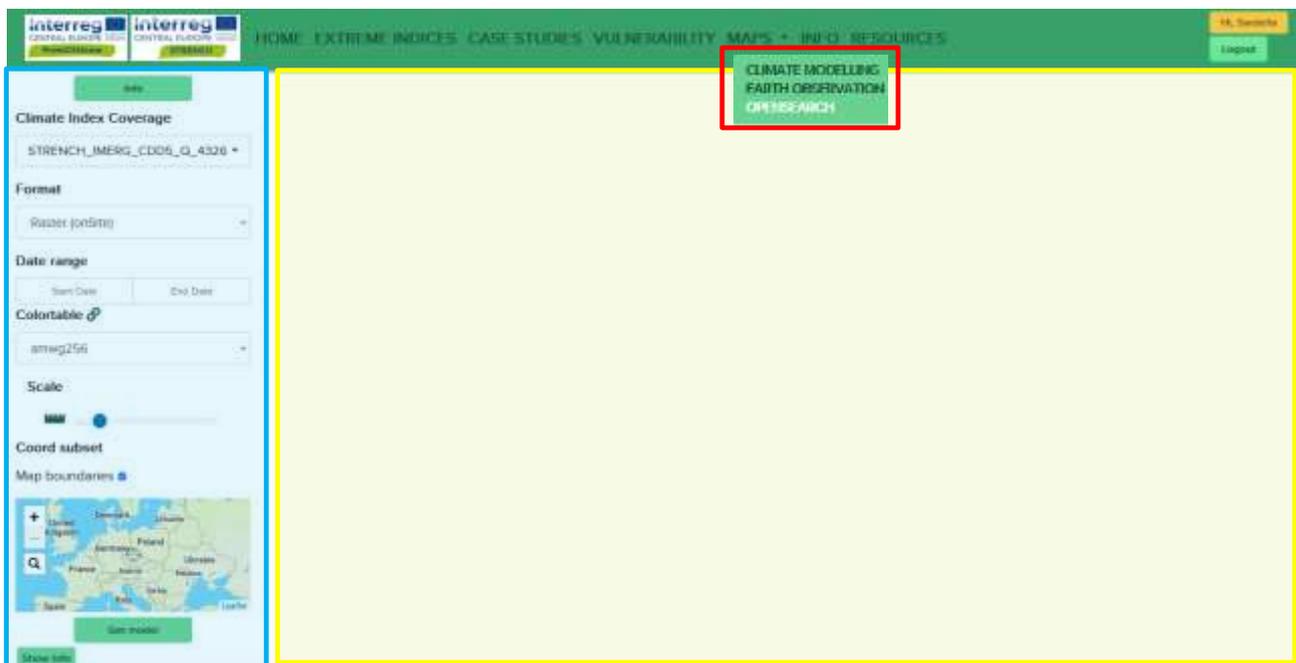


Figure 9. Screen shot of the introductory page related to “OPEN SEARCH” MAPS tool.

2.7 INFO

In this session of the WGT general information on both projects ProteCht2save and STRENCH and about the partnership is already available.



Figure 10 Screen shot of the INFO session of the ProteCht2save WebGIS tool for risk mapping. The figure shows the information of both projects ProteCht2save and STRENCH and logos of each partner involved.

2.8 RESOURCES

In this page has been collected all the scientific information used as reference for the implementation of the WebGIS Tool such as scientific papers, web sites, datasets and linked working groups. In addition, a session addressed to the Tutorial of this Web GIS Tool has been implemented (Fig. 11).

Figure 11. Screen Shoot of the “RESOURCES” page of the WebGIS Tool showing the main boxes containing tutorial and references.