



DELIVERABLE D.T1.2.1

Report including an Inventory of
outputs and approaches from EU
Projects for management cultural
heritage at risk

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With the contribution of all partners





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1. Introduction

This deliverable is foreseen in the Activity A.T1.2 *Ranking vulnerability of cultural heritage for risk assessment due to climate change*, as a first step focusing on the analysis of procedures, tools and database to be assimilated in the ProteCHt2save Web GIS Tool for Risk Mapping. This tool in fact, has been purposely conceived in order to be potentially integrated with: i) a procedure of risk assessment on cultural heritage due to flash flood, wind storm and landslides, in addition to heavy rain, flood and drought period; ii) different categories of cultural heritage (cultural landscape, historic parks, small ruined villages). The deliverable D.T1.2.1 aims at homogenization of data for cultural heritage management at risk from the projects selected for capitalization. Section 2 gives an overview of the participating projects' outputs, with an analysis of the STRENCH activities where they could be capitalized. Section 3 illustrates the major features of the ProteCHt2save WebGIS Tool for Risk Mapping. Section 4 highlights which outputs from previous projects are suitable for their inclusion and upgrade of the WebGIS platform (A.T1.3 *Development of a WebGIS tool for management of cultural heritage at risk*), which development is the major objective of WP T1. In addition, Section 5 presents the methodology for the homogenization of the data collected at different territorial levels (local/regional/national/international) for each Country/Region involved in STRENCH.



2. Participating projects' scenario and outputs capitalisation analysis.

2.1. General overview

STRENCH will build on the results achieved by successful projects related to the assessment of the impact (i.e. both risk and damage assessment) of climate change on landscape, historic parks and small ruined villages), exposed to disasters. In this Section an overview of the participating projects' outputs, with an analysis of the STRENCH activities where they could be capitalized is given.

The following project will be taken into consideration for the development of activities in STRENCH:

- 1) Interreg CE Project **ProteCHt2save**, coordinated by CNR-ISAC (LP) with ITAM (PP2) and DUK (PP3) as partners, will capitalize the online WebGIS tool (O.T1.2) as described in Section 2. Additionally, all the case studies and pilot actions (O.T4.1) will be included in STRENCH and revised if necessary, according with new methodologies. Therefore, the following pilot actions' results will be transferred in STRENCH:
 - Flood events in large basin (Czech Republic and Austria)
 - Fire due to drought periods (Croatia)
 - Extreme events of heavy rain (Italy, Hungary, Croatia, Poland and Slovenia)

The Decision support tool for critical analysis of cultural heritage vulnerability (O.T2.1) will feed into STRENCH output O.T1.2 and the ProteCHt2save output O.T3.1 (*Transnational strategies for cultural heritage protection in emergency situation in changing climate*) into STRENCH output O.T2.1.

- 2) Interreg CE Project **RUINS**, ITAM participating (PP2), will capitalize the outputs O.T1.1 (*Universal transnational model of sustainable preservation and protection of the medieval ruins*) and O.T3.1 (*Universal transnational model form of modern management of medieval ruins*) concerning management model for ruins revitalization with the aim of assessing the vulnerability of abandoned medieval hamlets in mountain areas exposed to hydrogeological risk and related strategies development (O.T1.2 and O.T2.1).
- 3) The Interreg CE Project **HICAPS**, in which the Villa Ghigi Foundation (FVG, PP4) was involved, will contribute to the STRENCH project with the study of the historic park and garden in the peri-urban area of Bologna, providing the results of the Local Action Plan (O.T1.3) and of the Handbook on Landscape accessibility for all (O.T2.3), with examples on how HICAPS partners have developed tools and models to improve the accessibility, conservation and enhancement of historic parks. FVG will contribute to an in-depth analysis on the management of public green areas and their vulnerability, in the context of the ongoing climate change. FVG will use its experience to identify and describe the effects connected to climate change that have affected the park in recent decades and propose sustainable management strategies for the conservation of historic gardens. These outputs will be useful for the STRENCH output O.T2.1, as well as for all the activities of the WP-C.
- 4) H2020 Projects **HERACLES** and **SHELTER**, SISTEMA participating (PP5), will put in the field many results related to coastal and inland monumental complexes and historic centers at risk due to floods and wildfires. The output contributions of these projects are multisectorial and cover a wide range of tasks: protocol / guideline, End-user requirements, site logistics, report on social impact, training material. The application of Earth Observation (EO) data from Copernicus services and products to increase the resilience of cultural heritage at risk, in SHELTER already experienced, will be considered for STRENCH development.



- 5) Interreg CE Project **BhENEFIT**, UIRS participating (PP7), will provide: i) the strategy for sustainable management of HBA in CE Region (O.T1.2), contributing to the elaboration of an approach for vulnerability ranking of cultural heritage. The online mapping tool developed in ProteCHt2save will be integrated with criticalities in the sustainable management of HBA highlighted in BhENEFIT.
- 6) FP6 **Noah's Ark** and FP6 **Climate for Culture** (ISAC, ITAM) for the application of climate models and damage functions/indexes for damage maps production. The experience gained in risk mapping and modelling will be fundamental for the implementation of the on line tool and the setting of recommendations and guidelines.
- 7) DG-EAC "**Safeguarding Cultural Heritage from Natural and Man-Made Disasters**" (ISAC, ITAM, DUK). The mapping of the existing strategies in the 28 MS for disaster risk management of CH and the recommendations developed and addressed to Public Authorities at different levels and operational bodies will be capitalized for the activity in STRENCH related to the integration of risk management strategies into territorial policies (A.T2.1, A.T2.3).

STRENCH will seek synergies with the Interreg CE Project **CULTURECOVERY**, Lake Balaton Development Coordination Agency (LBDCA) participated (PP6), which promotes the preservation of intangible CH, in order to bring a comprehensive perspective in heritage risk management. **CULTURECOVERY** deals with the recovery and protection of intangible cultural heritage. Despite its recognized importance, intangible cultural heritage is often underestimated and prone to be lost. The project represents a great potential for sustainably preserving and enhancing this heritage. This interaction will allow evaluating, as a potential preparedness strategy, the recovery of ancient and traditional techniques of maintenance and use of terraced landscapes, such as dry stone walling, which use is recommended in the Italian National Strategy of Adaptation to Climate Change as a measure to prevent hydrogeological instability and desertification.

2.2. Summarising table

In the following table are summarized the project outputs which are currently under evaluation for their capitalization in STRENCH Project.



Project to be capitalized	Output code	Output name	Output contribution description (manual, pilot site document, guideline, plan, strategy, database, tool, etc.)	Contribution to STRENCH Output	Contribution to STENCH Action	HOW TO DO (integration, implementation, harmonisation, upgrading, adoption)
Interreg CE ProteCHt2save	O.T1.2	Development of local maps for risk management and protection of cultural heritage	WebGIS Tool	O.T1.3	A.T1.3	UPGRADING the ProteCHt2save WebGIS Tool for Risk Mapping
	O.T2.1	Decision support tool for critical analysis of cultural heritage vulnerability	Managerial criticalities Physical criticalities	O.T1.2	A.T1.2	HARMONISATION
	O.T3.1	Transnational strategies for cultural heritage protection in emergency situation in changing climate	strategy	O.T2.1	A.T2.1	HARMONISATION
	O.T4.1	Pilot actions for improving local/regional capacities for the cultural heritage protection. case study 1) Flood events in large basin (Czech Republic and Austria) 2) Fire due to drought periods (Croatia) 3) Extreme events of heavy rain (Italy, Hungary, Croatia, Poland and Slovenia)	case study	O.T1.3	A.T1.3	UPGRADING Bielsko-Biala, Poland (PL) Ferrara, Italy (IT) Kaštela, Croatia (HR) Kočevje, Slovenia (SL) Krems, Austria (AT) Pécs, Hungary (HU) Troja (CZ)
Interreg CE RUINS	O.T1.1	Universal transnational model of sustainable preservation and protection of the medieval ruins	guideline	O.T1.2 O.T2.1	A.T1.2 A.T2.1	INTEGRATION
	O.T3.1	Universal transnational model form of modern management of medieval ruins	guideline/report	O.T2.1	A.T2.1 A.T2.3	INTEGRATION/ INPUT for the methodology of vulnerability assessment
Interreg CE HICAPS	O.T1.3	Local action plans	plan	O.T2.1	A.T2.1	INTEGRATION/ADOPTION scenario for the next few years of the Villa Ghigi Park



	O.T2.3	Handbook Landscape accessible for all	protocol / guideline	WP C	A.C.7	ADOPTION Examples, tools and models for improving accessibility of historical parks
H2020 HERACLES	n.a	Methodologies for earth observation data application to CH protection _site logistics				INTEGRATION (HERAKLION + GUBBIO)
	n.a	Methodologies for analysis of satellite data for estimation of precipitation, temperature and air quality	case study	O.T1.3	A.T1.3	List of available and needed datasets for the project performance, including satellite data
	n.a.	Deliverable D8.2 Description of the site and detailed end-users requirements and definition of the logistics for the monitoring system at GUBBIO	case study	O.T1.3	A.T1.3	HARMONISATION List of sensors and parameters (LST, RH, Air temperature, AOT, SO2, NO2) used for the site study
	n.a	Deliverable D1.1 Survey on guidelines and procedures for CH management	guidelines	O.T2.3	A.T2.3	ADOPTION
	n.a	Deliverable D10.1 Report on social impacts, societal resilience and cultural values awareness	report on social impact	O.T1.2	A.T1.2	HARMONISATION
H2020 SHELTER	n.a	Historic area Resilience structure - Validates all the developments in 5 different pilots where different heritage is present and different hazards are happening	case study	O.T2.2	A.T2.2	INTEGRATION Case Study 1 ('Building Scale') - 2019 Flooding in Venice, St Marks Basilica Case Study 2 'City Scale' - 2009 L'Aquila Earthquake in the Abruzzo Region Italy Case Study 3 'Regional Scale' - 2006 Wildfires in Galicia Spain
	n.a	wiki page - Complete list of hazards and respective ontology, useful for the project	wiki page	O.T1.1	A.T1.1	INTEGRATION
Interreg CE BheNEFIT	O.T1.2	Strategy for sustainable management of HBA in CE Regions	Strategy/CH criticalities	O.T1.3 O.T2.1	A.T1.3 A.T2.1	HARMONISATION
FP6 Noah's Ark/Climate for Culture	n.a.	Vulnerability atlas and Hazard maps	Methodology/maps	O.T1.1 O.T1.2 O.T1.3	A.T1.1 A.T1.2 A.T1.3	Harmonisation/adoption



Noah's Ark	n.a.	Guidelines	guidelines	O.T2.1	A.T2.1	INTEGRATION
DG-EAC "Safeguarding Cultural Heritage from Natural and Man-Made Disasters"	n.a.	Recommendation	Recommendation	O.T2.1 O.T2.3	A.T2.1 A.T2.3	HARMONISATION/adoption
Interreg CE CULTURECOVERY	O.T1.4	Joint strategy for preservation of cultural heritage based on ecomuseums	strategy	O.T2.1	A.T2.1	HARMONISATION for cultural landscape
	O.T1.2	case study	case study	O.T1.3	A.T1.3	INTEGRATION Herb Valley Ecological Centre, Zánka, Hungary, Lake Balaton Development Coordination Agency

Note:

HARMONISATION = the act of making different plans, situations, etc. suitable for project activities, or the result of this

INTEGRATION = to combine two or more things in order to become more effective

UPGRADING = to improve the quality or usefulness of something, or change it for something newer or of better standard

ADOPTION = the process of starting to use a new product or service

IMPLEMENTATION = the act of putting a plan into action or of starting to use something



3. ProteCHt2save WebGIS Tool for Risk Mapping.

The ProteCHt2save WebGIS Tool (WGT) for Risk Mapping has been designed to support policy and decision makers in the identification of risk areas and vulnerabilities for cultural heritage in Central Europe exposed to extreme events linked to climate change, particularly heavy rains, flood and fire due to drought periods. The ProteCHt2save WGT is one of the major outputs of the ProteCHt2save project and it is an online tool already available at <https://www.protecht2save-wgt.eu/>. It merges 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 elaborated during the project, that represent the core of this tool.

Risk maps with spatial resolution of 12X12 Km referring to heavy rain, flooding, drought and extreme heat are provided. Specifically changes of temperature and precipitation and of climate risk indices are available for 2 historical periods (1987-2016 wrt 1951-1980) and under Representative Concentration Pathway scenarios RCP4.5 (stabilization) and RCP8.5 (pathway) for 2 future 30-year periods (2021-2050 & 2071-2100) with respect to the reference historical one (1976-2005).

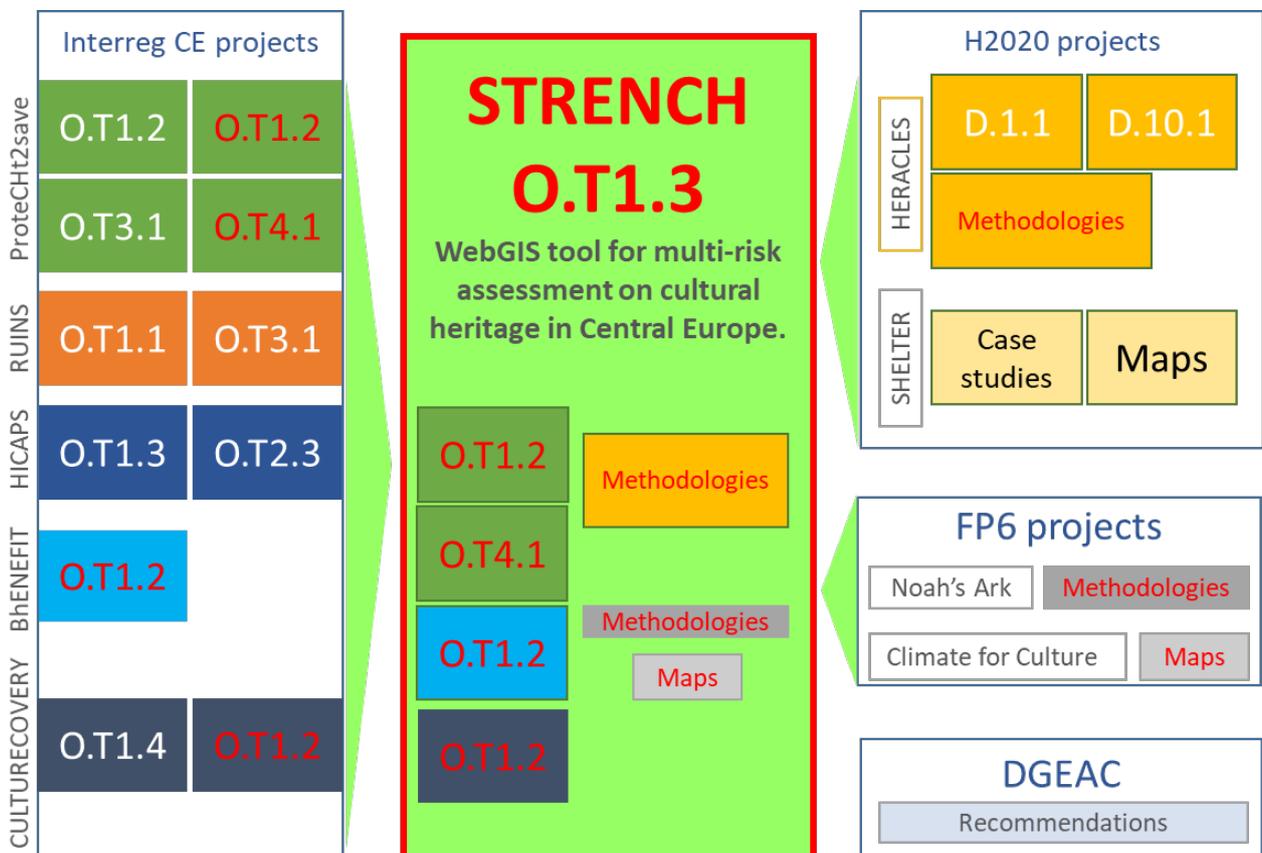
This WebGIS Tool has been conceived with the aim to create an on-line platform that can be upgraded whenever new data, maps, case studies and other information are available and useful for the purpose of the Web Tool. Based on this, the ProteCHt2save WGT will be improved in STRENCH by integration with:

1. Climate extreme indices, elaborating new ones in order to cover a higher range of hazards mainly linked to temperature and precipitation (A.T1.1).
2. Application of satellite datasets for the elaboration of selected indices at seasonal time scale (A.T1.1).
3. Set of maps elaborated using Earth Observation datasets (NASA GPM IMERG) and Copernicus Climate Change Copernicus Services (ERA5 Land) (A.T1.1).
4. New case studies and harmonization with the existing ones (A.T2.2).
5. A methodology for vulnerability ranking and the rate of vulnerability of the case studies by including new CH categories and hazards in order to achieve the objectives foreseen in STRENCH (A.T1.2).



4. Selected outputs to be capitalized in the new WebGIS Tool.

This Section highlights, which outputs from capitalized projects are suitable for their inclusion and upgrade of the WebGIS platform (A.T1.3 *Development of a WebGIS tool for management of cultural heritage at risk*), which development is the major objective of WP T1 (O.T1.3 WebGIS tool for multi-risk assessment on cultural heritage in Central Europe).





5. Necessary steps for data inclusion in the new WebGIS tool.

With the aim to integrate the identified output from the capitalized project in STRENCH, an exhaustive analysis of each of them is necessary in terms of evaluation of existing georeferenced data, typology and format of maps and platforms, spatial resolution and/or time coverage.

Following the preliminary analysis carried out in the Table of Section 2, the outputs from participating projects have been identified for their integration and harmonization in the ProteCHt2save WebGIS Tool for risk mapping as required in the activity A.T1.3 “Development of a WebGIS tool for management of cultural heritage at risk”. The potential outputs have been highlighted with green boxes in the Table of Section 2.

Furthermore, other important additional material such as hazard/risk maps, GIS Platforms and National Portals not strictly linked with the capitalized projects but existing as technical and scientific background among the partners will be taken into account for their potential harmonization and integration in the new WebGIS Platform. These additional outputs could be give interesting and useful information related both to the natural hazard and cultural heritage categories considered in the project.

The WebGIS tool can be integrated with further data, complying with the operational structure of the existing tool and an upgraded WebGIS tool can be release.

As far as concerns the data inclusion, the following steps are prioritized for georeferenced data, maps and platforms, through a cascade decision process:

1. original format (digital required)
2. file extension (shp, geotiff required or similar)
3. evaluation for necessary data conversion
4. data spatial resolution
5. time coverage
6. language

6. Final remarks

With the development of the present deliverable, efforts have been devoted to report the most appropriate tools, plans, strategy, data for projects’ capitalization in STRENCH.

The identified outputs of previous and ongoing funded projects at European level will be collected, selected and included in STRENCH activities following a priority order of action:

upgrading > harmonisation > integration > adoption > implementation

The elaboration of OTs collected by the partnership evidenced weakness and strengths in the existing measures and tools for risk management in response to disasters and extreme events aiming at the protection and safeguarding of built/cultural heritage. The obtained results will be of paramount importance in the elaboration/implementation of plans and tools for cultural heritage protection in emergency situations (WPT1) and the subsequent testing and implementation on site (WPT2).