



RISK ASSESSMENT AND SUSTAINABLE PROTECTION OF
CULTURAL HERITAGE IN CHANGING ENVIRONMENT

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Disasters and catastrophes pose risks not only to the conservation of the 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 due to the loss of tourism revenues, and for the livelihoods of local people who are dependent on it. ProteCht2save contributes to the

improvement of capacities of the public and private sectors to mitigate the impacts of climate change and natural hazards on cultural heritage sites, structures and artefacts. The project focuses primarily on the development of feasible and tailored solutions for building resilience of cultural heritage to floods and events of heavy rain.

WHAT HAPPENED IN THE LAST FEW MONTHS?

CULTURAL HERITAGE CHALLENGES CLIMATE CHANGE - INTERNATIONAL WEBCONFERENCE - 23 June 2020

The Final conference has been an online event organised as the final step of the project. The event has been jointly organised by the lead partner ISAC CNR, Municipality of Ferrara and Danube University of Krems with a high participation of around 100 people from all around Europe. In addition, all the partners attended the event and the speakers involved are deep experts of the cultural and scientific world in terms of protection of the historical artistic heritage, resilience and climate change.

During the overall project implementation, the partners worked on strategies for the protection, management and sustainable use of cultural heritage, as well as its protection considering climate change effects, through the development and implementation of regional and local strategies. Despite the significant resources hitherto addressed at European level for the protection of cultural heritage, **further efforts are needed to ensure sustainable management of monumental assets, archaeological sites and related exhibits exposed to extreme events related to climate change**, as deeply described by Mrs. Alessandra Bonazza project manager of the project.

In this perspective, **tools for risk mapping, transnational preparation strategies, coordinated evacuation plans in emergency situations and early warning systems specifically dedicated to the protection of heritage assets and subsequently integrated into international approaches and agreements for the risk of catastrophes have been developed and the results shared** during the conference by the partners ITAM, DUK, BBD and ISAC.



The conference started with an intervention by the Counsellor with responsibility for European Projects for the Municipality of Ferrara, Alessandro Balboni: *"The cultural and architectural heritage of our cities represent a unique wealth of our country, however they are always exposed to environmental risks more. The increase in this risk is part of the wider climate change which takes on an increasingly extreme and aggressive connotation"*. The interventions to be programmed must be able to offer real protection to our monumental assets, not only for its contingency, but also for its use. The users of our architectural heritage are represented both by visitors and tourists and by ordinary citizens, and all of them deserve from the institutions the guarantee to use these goods safely and the possibility of accessing them regardless of their physical condition.

Ferrara - the initially location of the in loco conference - is a UNESCO site, its cultural heritage represents not only its identity but also a heavy variable in economic activity. The aspect of economic sustainability represents an incentive for the smart conservation of these assets, this approach cannot be limited to implementing a mere conservation for tourism purposes, but must put in place increasingly elaborate and integrated resilience strategies, not only in Ferrara but in all the involved regions of the project.

The **pilot sites** of the ProteCH2save project are **cities highly affected by climate change**, and they are certainly particularly interesting case studies, capable of outlining innovative guidelines. The ProteCH2save Project can be one of them from now and in the future.

Programme: [HERE](#)

LOCAL FOCUS GROUP MEETINGS

HUNGARY - 3rd LFG (GBC), 7 May 2020

The 3rd LFG meeting of the collaborative practice took place in a virtual (**Zoom**) **meeting room**. The leader of the meeting was **Gábor Domján** lieutenant-colonel, Chief Inspector of Civil Protection of the Baranya County Disaster Management Directorate.

During the focus group meeting, the participants were able to gain **insight into the experiences of the exercise "Monument 2019"** held on 16 October 2019, as well as into the **results of the project**.



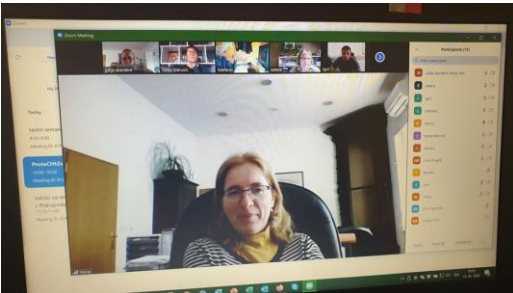


In the first half of the focus group meeting, Gábor Domján briefly presented the series of events of the previous practice on October 16, illustrated with pictures. Then, through the handouts and case studies sent as an attachment to the invitation, which the participants had previously studied, the lessons learned, good and bad practices were listed. As part of the focus group

meeting, Yvette Szabados (GBC) presented the results of the ProteCHt2save project. Gábor Domján presented the further steps, which also covered the detailed action plan and strategy, finally the issues and suggestions raised were discussed and analyzed by the participants.

SLOVENIA - 3rd LFG (Kočevje), 14 May 2020

The Municipality of Kocevje organized the third meeting of key local stakeholders (representatives of the Regional Museum of Kocevje, local fire brigade and civil protection unit, security company as a first responder, curators advisors and representatives of Municipality of Kocevje).



New developments on the project along with new outputs on the project were presented. The participants also discussed the **organization of evacuation exercise** that will be held in June. The scenario of the exercise will be that due to heavy rain the basement of the municipal building was

flooded and the storm destroyed part of the roof of Seskov dom where the regional museum is located. Water flooded the museum's storage rooms, soaking the floor and valuables in their archive. The exercise will be of a demonstration nature with the goal to obtain a protocol for the protection of cultural heritage in the event of heavy rain.

ITALY - 3rd LFG, 20 May 2020

The 3rd Local Focus Group in Italy has been held during an **on line session** of the two years Master of Science for the **Conservation - Restoration of Cultural Heritage** organised by the University of Bologna.

ISAC CNR presented the project within the course Environmental Impact on Material, Deterioration and Ageing. The **students had the opportunity to test the GIS tool** developed within ProteCHt2save and performed the following pilot testing:

- identify major threats in the near and far future for the site under study (heavy rain, flooding pluvial and of large basin, drought) giving also quantification of the values expected for the different climate indices plotted;
- evaluate the possible impact on the heritage site of a case study;





- look at the past events of disasters at the site and the mitigation actions adopted up to now
- and as final step evaluate if changes on the actions undertaken are necessary for facing the climate changes expected and identified in the first phase.

The students successfully answered to the test implemented in each project pilot sites and positively evaluated the potentialities offered by the web GIS tool.

OUTPUTS

Development of local maps for risk management and protection of cultural heritage

The online **Web GIS Tool (WGT)** developed in the framework of ProteCht2save by CNR-ISAC visualizes in an interactive way risk maps of Central Europe, with high spatial resolution (<https://www.protecht2save-wgt.eu/> or from the Project web site clicking on the Web GIS Tool button).

The WGT 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. It has been created in order to be further implemented and tailored on the basis of specific user requirements. The WGT represents an advancement in the research on the evaluation of climate change impact on Cultural Heritage.

Maps with spatial resolution of 25X25 km for historical observation have been elaborated for both climate extreme indices and variables, considering the period 1987-2016.

Risk maps with spatial resolution of 12X12 km referring to heavy rain, flooding, drought, and extreme heat are also provided based on changes of temperature, precipitation and climate extreme indices for 2 future 30-year periods (2021-2050 & 2071-2100) with respect to the reference historical one (1976-2005) and under Representative Concentration Pathway scenarios RCP4.5 (stabilization) and RCP8.5 (pessimistic).

The web site of the WGT is structured in different sections:

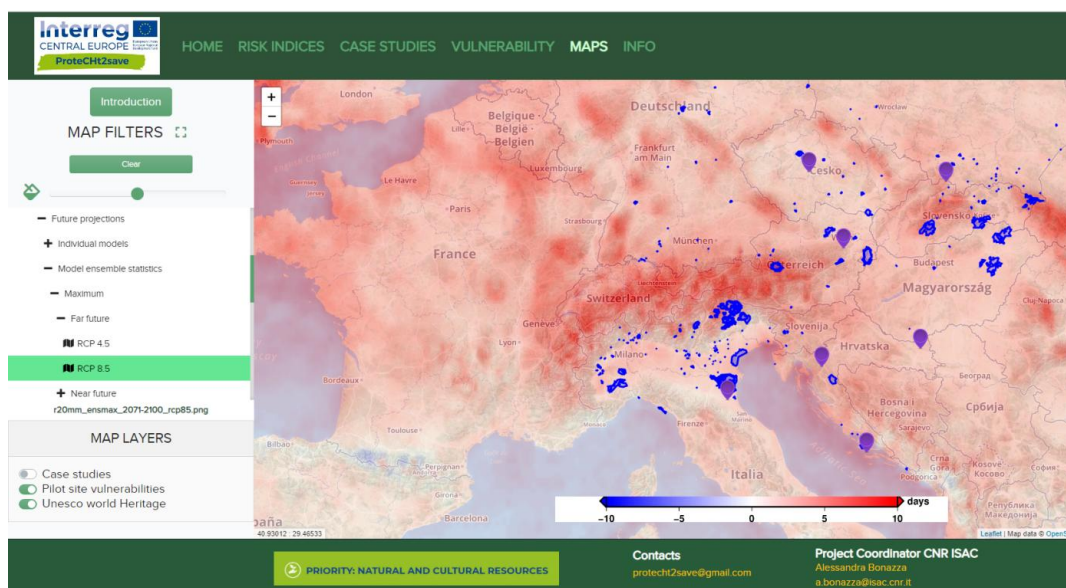
- on “Home” and “Info” a brief introduction to the WGT and information on the project are available;
- in the “Risk Indices” the climate extreme indices selected for the project, internationally accepted by the scientific community are indicated;



- in the “Case studies” a description card of each site with some technical information;
- on the “Vulnerability” the critical elements in the resilience both physical and managerial for local vulnerability of cultural heritage are reported.

The obtained maps describe how and where possible changes related to the specific climate risk index or climate variable selected affect/will affect the area of Central Europe and its heritage in the specific time period, with particular reference to the pilot case studies.

For more information: Sardella A., Palazzi E., von Hardenberg J., Del Grande C., De Nuntiis P., Sabbioni C., Bonazza A. (2020) Risk Mapping for the Sustainable Protection of Cultural Heritage in Extreme Changing Environments. *Atmosphere*, 11, 700, [DOI:10.3390/atmos11070700](https://doi.org/10.3390/atmos11070700).



Handbook on Rescue Strategies and Procedures

The handbook for recovery operations was designed as digital interactive application for smartphones in the form of an educational game. *CHRT: Vltava Rising* is available via the various app stores since June 2020, the user can choose from 8 languages as subtitles. The player - resp. learner - faces a **disaster scenario** and has to coordinate a Cultural Heritage Rescue Team (CHRT) consisting of different decision-makers and experts. In the fictional game scenario, Prague will be flooded by a Vltava flood within the next 72 hours, according to the forecasts of meteorological experts. In this short period of time, a special exhibition for which no emergency plans are available and which is made up of various international loan exhibits must be evacuated from a museum. Level 1 is designed as a role-playing video game (RPG), which is primarily based on dialogues between the different CHRT members. The player learns how to gain an overview of a crisis situation, who the responsible decision-makers are, which are the



actors and resources available, and which facts have to be clarified in advance to the actual evacuation. The levels 2 and 3 were developed according to the principle of a turn-based strategy game (TBS), in which **the player controls different characters** in a certain sequence and has to fulfill the tasks they are responsible for. The team is already on the premises of the museum and has to (re-)evaluate the situation on-site, carry out different security measures tailored to the respective threat and take stock of the cultural heritage objects. Finally, the movable cultural assets declared as endangered must be documented and catalogued, further packaged accordingly depending on the material they are made of, and finally brought to a safe storage site. This process, outlined in the levels 1 to 3, corresponds to the correct procedure concerning the recovery of movable cultural property.



EOC Director (© CHRT: Vltava Rising 2020)

Promotional video

The ProteCHt2save [promotional video](#) has been created compiling material of all partner countries and including interviews with experts from the project consortium. In the first part of the video, the challenges and issues tackled during the project as well as the different types of disaster dealt with are presented. The project's focus on climate change and related natural disasters which threaten our movable and immovable cultural heritage is outlined and approaches in order to strengthen the resilience of cultural heritage are introduced. The tools which have been developed in the course of the project (WebGIS tool, decision support tool, Manual for Owners and Managers, video game) are promoted and their appropriate utilization in the protection and preparedness of built and movable cultural heritage against natural disasters is explained. The last part of the video shows segments of all the pilot exercises which have been conducted at the seven different pilot sites. It emphasizes the importance of joint trainings of emergency responders and cultural heritage experts in order to prepare for future disasters.



Strategies of preparation and evacuation plans for the crisis situation

Within the task group *T4.1. Testing and implementation at pilot sites* each project partner carried on the practical exercises at their pilot sites. **The pilot actions were divided into two groups:**

1. Practical exercises aimed to **verify the prevention measures** on the cultural heritage sites in case of the flood, fire caused by the drought and intense rainfalls.
2. Practical exercises aimed to **test evacuation plans** at the cultural heritage sites in case of the flood, fire caused by the drought and intense rainfalls.

Within the deliverable *DT4.2.1 Evaluation report for pilot action monitoring and assessment of preparation strategies*, the **complex analysis and assessment of the exercises and the efficiency of the plans tested was performed**. After the analysis the following **conclusions** were drawn:

1. **Change of legal regulations** so that they require the creation of plans to protect cultural heritage in the event of crisis situations. The plans should include procedures for dealing with various emergencies, along with maps of the routes of evacuation of valuable items in the order of their evacuation based on their value.
2. The need to organize **cyclical training in the field of protection and evacuation** of historic buildings for rescuers and local people was noticed.
3. The need to organize **cyclical practical exercises on the evacuation** of a historic building or building containing historic exhibits with the participation of rescue services was noted.
4. **Rescue units** closest to the cultural heritage should be equipped with **special equipment** enabling its quick and effective rescue.
5. **Cultural heritage objects** should have **special equipment and protective materials** to protect them and prepare movable monuments for evacuation.

Thanks to the adequate preparation and testing of the existing evacuation plans for the crisis situations and of the preparation strategies, each partner of the project



ProteCHt2save gained the reliable information about their effectiveness, insufficiencies and the changes necessary to undertake the better protection of the cultural heritage.

The conclusions of the analysis of the performed exercises regarding the differences between the planned actions and the actual work of the rescuers and the managing persons, contributed to the implementation of the deliverable *DT4.2.2 Setting up of emergency plans for the target heritage sites*. Based on these plans, **each partner created or updated their plans of the protection of the cultural heritage in case of the crisis situation**. The creation and the update of the



documents will support the development and improvement of the safety of the cultural heritage.

The last task of the ProteCHt2save was the creation of the *DT4.2.3 Guidelines for improvement and adoption of emergency plans at heritage sites in changing climate*. The document **recommends the activities to foster the development of emergency plans** for protection and preservation of the cultural heritage based on the analysed existing systems in the partner countries. The document gives the **practical advice and indications how to address the bodies responsible for the development and improvement of the protection** and rescue plans for the tangible cultural heritage on various levels.

The deliverable includes the **Memorandum of Understanding** between the partner municipalities and local governments of the project ProteCHt2save regarding the development and fostering the concept of the project, i.e. the preservation and rescue of the cultural heritage in the changing environment.



ProteCHt2save key facts

Project duration: 01.07.2017 - 30.06.2020

Project budget: 2,150,549 €

ERDF funding: 1,787,110 €

Website: <http://www.interreg-central.eu/Content.Node/ProteCHt2save.html>

LEAD PARTNER

National Research Council of Italy
- Institute of Atmospheric Sciences
and Climate



PROJECT PARTNERS

Institute of Theoretical and Applied
Mechanics of the
Czech Academy of Sciences



University for Continuing Education
Krems Danube University Krems



Bielsko-Biala District



Regional Development Agency
Bielsko-Biala



Municipal of Ferrara



Municipal District Praha – Troja



Government of Baranya County



City of Kaštela



Municipal of Kocevje

