

ANALYSIS OF VULNERABILITY OF CULTURAL HERITAGE AGAINST FLOODS

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Abstract: *Introducing first part of the project Methodology of Protection and Rescue of Cultural Heritage against Flood dealing with creating catalogue of damage on cultural heritage due to floods. The aim of this catalogue is to collect, synthesize and analyze possible known information about the damage linked with a particular object of protection and material.*

Keywords: *Cultural heritage, flood, material vulnerability, damage risk.*

1. Introduction

Flood is a natural phenomenon that cannot be avoided but in past years its impact is rapidly growing. During last 15 years we have been experiencing many severe flooding that influenced almost every part of the Czech Republic. Except damages of life and property there have been loss of historical monuments, devastation of sites and changes in historical landscape. Irreversible loss and great expenses spent to restoration and renewal led to the conclusion that integrated flood risk management is needed if we want protect effectively historic environment against flooding.

From the analysis of flood impact in selected towns and villages and from other European projects emerged series of serious facts:

- insufficient foreknowledge of owners and stakeholders about value of cultural heritage objects and necessity of special approach during remedial works, especially in heritage reservations and zones,
- inaccessibility of practical experience from floods in past years,
- lack of effective instructions for owners and administrators,
- lack of experience and methodic guidelines for local government in unusual situation happening on cultural heritage site,
- inappropriate use of materials during renovations,
- importance of proper maintenance and good technical condition of buildings,
- importance of preventive measures,
- absence of guidelines for flood protection planning on outstanding cultural heritage sites,
- need of transparency in legislative and processes of flood protection planning to achieve maximal efficiency and sensitivity,
- underestimated role of historical water works

2. Catalogue of damage

According to this experience our project Methodology of Protection and Rescue of Cultural Heritage against Flood was formed. First part of the project is dealing with creating catalogue of damage on cultural heritage due to floods. The aim of this catalogue is to collect, synthesize and analyze possible known information about the damage linked with a particular object of protection and material. Furthermore this catalogue analyzes possible damage vulnerability at these objects of cultural heritage. A special attention is paid to prevention and tends to recommend suitable measures for different

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situations in this part. Both moveable and immovable objects of cultural heritage are included in the catalogue.

Catalog will have an electronic form and should be available within wider informational server of Ministry of Environment ČR POVIS for free. Owners, administrators of the cultural heritage and professional public are considered as possible users. Catalogue should serve as a tool for assessing damage vulnerability for moveable and immovable cultural heritage.

The experiences from last recent floods in the Czech Republic (especially disastrous floods in 1997 and 2002) are used as inputs. Also the practical knowledge about possible damage and its prevention from specialists of different branches serves as an important resource.

A conceptual ontological map was created and it serves as a functional tool for creating the base of the damage vulnerability catalogue for various objects of cultural heritage. The catalogue is organized in two main parts. Input factors will be given to user to define his object of interest and characteristics of flooding. As input data are specified:

- characteristics of flooding – water height, dynamics, cleanness of water, period of occurrence, length of activity,
- temperature, moisture, season,
- construction system, technical state and material creating the object of interest

Based on these user defined inputs, output analysis is created:

- vulnerability of the object to probable damage,
- damage description, description of damage mechanism,
- recommended preventive measures

The vulnerability of flood damage is categorized according to the flood action and object type to three main degrees: a) no consequence or very small damage (resistant objects) b) medium damage or significant consequence c) critical consequence, total damage, destruction of the object. However finer categorization within these main degrees is also possible. Examples of recorded damage on cultural heritage in the past are demonstrated in the form of damage cards. There are described object characterization, flood action and damage description in detail. Performed reconstruction and protective measures are described as well.

3. Conclusions

Right prevention is considered as most effective measure and more sensitive towards objects itself. It reduces loss of cultural historic value and authenticity. The catalogue of the damage vulnerability due to floods will help to plan and optimize the correct prevention measures applied in time to protect the objects of cultural heritage in the future.

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References

- Drdácký, M., Binda L., Hennen I.Ch., Koepp, Ch., Lanza, L.G., Helmerich, R. (eds.) (2011) *CHEF – Cultural Heritage Protection against Flooding*. Institute of Theoretical and Applied Mechanics AS CR, v.v. i. Prague.
- Drdácký, M. (ed.) (2010) Special Issue: Flood impacts to Heritage Structures, *Journal of Performance of Constructed Facilities*. Vol. 24 No. 5.
- English Heritage (2004) *Flooding and Historic Buildings*, Technical Advice Note.