



Recording disaster damage and loss data for cultural heritage: challenges and new developments

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Abstract: The Sendai Framework for Disaster Risk Reduction (SFDRR) upholds the development and implementation of measures to reduce hazard exposure and vulnerability to disasters. Among other aspects, the SFDRR recognizes the importance of cultural heritage for society, thus emphasising the need to assess the impact that potential hazards may have on the built cultural heritage. Developing adequate risk assessment and management processes are fundamental towards this end and disaster damage and loss data are known to be essential for such processes. The development of systems, models and methods to collect and handle such data is, thus, seen as a worldwide priority. In this context, the paper presents a database framework for the worldwide collection of immovable cultural heritage disaster loss data currently under development. The concepts and technical aspects related to the data being collected and its structure are discussed, as well as the type of indicators being recorded. Challenges regarding disaster loss data collection for cultural heritage are discussed, as well as the benefits of these data for developing more rational disaster risk management approaches for cultural heritage.

Keywords: Cultural heritage, disaster damage, disaster loss data, database.

1. Introduction

Existing international frameworks and programmes for disaster risk reduction (DRR) emphasize the need to develop and implement measures to reduce hazard exposure and vulnerability to disasters. Among other aspects, current DRR initiatives such as the Sendai Framework for Disaster Risk Reduction (SFDRR) (UN, 2015) recognize the importance of cultural heritage and its irreplaceable value for society. Therefore, such initiatives clearly highlight the need to assess the impact that potential hazards may have on the built cultural heritage. Developing adequate risk assessment and management processes are fundamental towards this end and it is known that systematically collected and robust disaster damage and loss data are essential for such processes. The development of systems, models and methodologies to collect and handle such data should, therefore, be a worldwide priority.

Existing disaster loss data recording initiatives such as the EM-DAT/CRED, SIGMA/SwissRe, NATCAT/MünichRe or DesInventar/UNISDR databases are undoubtedly important sources of information in terms of the damages and losses that occurred in worldwide disasters. Recording such data is known to be useful for the purpose of loss accounting, forensic analysis of disasters and disaster risk modelling (De Groeve *et al.*, 2014). For example, this data can provide an objective baseline for risk assessment as well as for mitigation prioritization and decision making. However, the data from these databases does not include damage and losses to cultural heritage. Hence, without this important component, current loss estimation procedures are unable to provide a sound and comprehensive quantification of disaster impacts.

There is currently no systematic collection of data about the impacts of hazardous events on cultural heritage properties. Existing data on damages and losses to cultural heritage is scattered among various



agencies (national and international) without any coherence and coordination. Furthermore, no standardized methods and tools have been developed for cultural heritage disaster data collection until now. Therefore, specific approaches and methods are required to address these issues. In this context, the proposed paper presents the DALIH (Damage and Loss Inventory for Heritage) database currently being developed for the worldwide collection of immovable cultural heritage disaster loss data. The concepts and technical aspects related to the data being collected and its structured organisation are discussed herein, as well as the type and format of the indicators being recorded.

2. Overview of the DALIH database for cultural heritage

A database specifically devised for the collection of cultural heritage disaster loss data named DALIH has recently started being developed within the project RIACT (Risk Indicators for the Analysis of Cultural heritage under Threat). The database aims to provide a standard for loss and damage recording in immovable cultural heritage supported by international institutions such as UNESCO, ICOMOS, ICCROM or ICOM, as well as other organizations dealing with cultural heritage. The main purpose of the DALIH database is to record the occurrence of damages and losses in worldwide immovable cultural heritage properties caused by natural or man-made hazardous events. The main objective of this initiative is to develop an efficient tool that will provide institutions managing and protecting cultural heritage with:

- a systematic and standardized recording of cultural heritage disaster-related data, from both natural and man-made hazards;
- a reliable accounting of cultural heritage losses;
- adequate data for the analysis of disaster trends and risk mitigation needs in cultural heritage.

One of the key issues of the database development was the definition of a simple system of categories for the type of cultural heritage properties that are considered by the database. Although several classifications and definitions of cultural heritage categories can be found in the literature, i.e. see (Blake, 2000; Vecco, 2010; Fernández-Freire et al., 2014; Prastakos and Gkadolou, 2015), none of these approaches was seen to be entirely satisfactory in order to accommodate different types of immovable cultural heritage assets in a simple, general and structured way. Therefore, the following system of Heritage Categories was developed which establishes the importance of a certain immovable cultural heritage item:

- UNESCO World Heritage Sites
- Properties Protected by the Hague Convention
- Listed National Heritage
- Listed Subnational Heritage
- IUCN Protected Areas
- Properties of Local Significance

Given that some of these categories may overlap (e.g. a UNESCO World Heritage Sites can also be a Listed National Heritage), more than one Heritage Category can be assigned to a certain cultural heritage property. For each of these categories, an additional descriptor is also assigned to describe the type of cultural heritage item. This descriptor establishes that a given cultural heritage item belongs to one of the following Unit Identification types:

- **Single unit property:** an individual monument or a natural landscape
- **Multiple unit property:** a group of monuments, an historic landscape, an historic town, an urban block of cultural significance

It is noted that within this classification for immovable cultural heritage, a museum building together with its collections is treated as a single unit property.

The hazardous events recorded by the database range from small-scale events that only affect a single cultural heritage property to large and widespread ones that affect a larger number of heritage assets. The



database records basic identification and information about the main hazardous event (and secondary events that may have been triggered by the main event) such as the hazard type/subtype, the GLIDE number, geographical information (country, continent, location, latitude and longitude) and temporal information (start/end date, local time), (Figure 1). For each event, the database records information about the cultural heritage properties affected by the event. This includes basic descriptions about the cultural heritage properties before they have been damaged along with a description of the damages and losses they suffered. The damage description can be illustrated using media files such as photos, videos or reports that can be uploaded to the database. Each cultural heritage property affected by an event is then associated to a Heritage Category and an Identification Type (according to the previously referred classifications), to one or more Property Classes (e.g. religious facility, archaeological site, residential facility, landmark, nature reserve, park, marine zone, rock formation, etc.), to a Value (qualitative) and to one or more Construction Materials (only for built properties). In terms of disaster data, the database records the (qualitative) damage level of each cultural heritage property, available information on economic losses and data regarding emergency procedures that may have been activated following the disaster.

Figure 1 – First screen of the DALIH database where the main hazardous event is identified.

The development of the DALIH database is particularly important given the possibility of using the data it collects in different steps of the cultural heritage risk management cycle (Figure 2). Performing a detailed risk assessment of cultural heritage properties is often a difficult task, given the complexity and the multidimensional value of cultural heritage. In these situations, using additional damage and loss data from past events recorded by disaster databases can be particularly helpful. Furthermore, the data collected by disaster databases is also relevant for the analysis and decision-making step, as well as for the risk mitigation and treatment step. Information on past experiences can provide valuable guidance for the definition of the approaches that are best suited to protect a certain cultural heritage asset or to create awareness regarding the need to develop new risk mitigation measures.

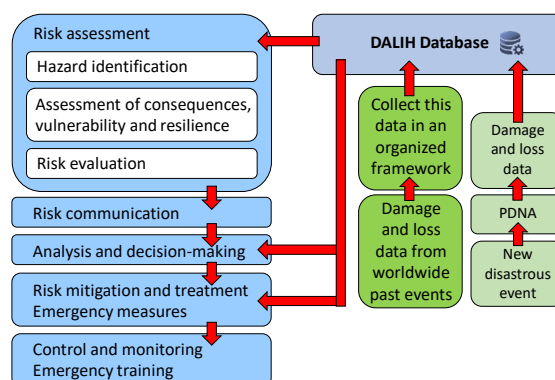


Figure 2 – The DALIH database within the risk management cycle for cultural heritage.



3. Final remarks

International frameworks and programs for DRR are clear in their objectives of reducing hazard exposure and vulnerability to disasters. Furthermore, the importance of cultural heritage and its irreplaceable value for society is also clearly acknowledged in these objectives. However, how can disaster loss reduction be measured in cultural heritage if there is no reliable loss data on the impacts that disasters have on this sector? Currently, it is clear that existing disaster loss accounting systems underestimate the true cost of disasters as a result of several factors. One of the factors is the inability to account for the disaster impacts on cultural heritage. Disaster loss databases are important tools to analyse patterns and trends of disaster losses and disaster risk based on past events. By understanding these patterns and trends, future losses can be mitigated by the implementation of efficient targeted measures. Furthermore, disaster loss data can also be used to determine if disaster risk management is actually being efficient in reducing risks as a result of DRR policies and investments. The development of a database specifically devised for the collection of cultural heritage disaster loss data such as the DALIH database is therefore fundamental and will provide important data for the development and preparation of better heritage-focused disaster mitigation strategies for the future.

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References

- Blake, J. (2000). On defining the cultural heritage. *International and Comparative Law Quarterly*, 49(01), 61-85.
- De Groeve, T., Corbane, C., Ehrlich, D., Poljansek, K. (2014). Current status and Best Practices for Disaster Loss Data recording in EU Member States: A comprehensive overview of current practice in the EU Member States. Scientific and Technical Research Reports. Report EUR 26879.
- Fernández-Freire, C., Parcero-Oubiña, C., Uriarte Gonzalez, A. (Eds.) (2014). A data model for Cultural Heritage within INSPIRE. *Cadernos de Arqueologia e Património*, 35.
- Prastakos, P. Gkadolou, E. (2015). Adding a geographical component in cultural heritage databases. Apostolos Sarris (ed), Best Practices of Geoinformatic Technologies for the Mapping of Archaeolandscapes. GeoSat Research Lab of the Institute for Mediterranean Studies - Foundation of Research & Technology.
- UNISDR (2015). Sendai framework for disaster risk reduction 2015-2030. UN world conference on disaster risk reduction, 2015 March 14-18, Sendai, Japan. Geneva: United Nations Office for Disaster Risk Reduction, http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf, accessed in March 6, 2016.
- Vecco, M. (2010). A definition of cultural heritage: From the tangible to the intangible. *Journal of Cultural Heritage*, 11(3), 321-324.