Risk Management in Cultural Heritage. Methods of Analysis

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Abstract: Cultural heritage management is about striking a balance between developing the tourism industry, generate revenue while still conserving the physical integrity of sites, promoting and celebrating their educational, historic and cultural values. According to UNESCO, heritage is our legacy and cultural identity that we pass on to the next generation. Tangible features, such as monuments, groups of building, and both historic and natural sites, are considered as part of our heritage by UNESCO. Identifying and developing interdisciplinary methods that can capture the 'invisible' vulnerability, value, and capacity of cultural heritage is considered an urgent policy need. This need is greatest in developing countries where people often lack the resources and agency to develop or adopt frameworks for risk-informed management in which concerns the cultural patrimony. Tools and methods have been developed in order to support a risk management strategy, thus not all of them can be applied regardless of the natural context and the local social and political vulnerability.

Keywords: risk management, cultural heritage, tourism, sustainability.

1 Introduction

Cultural heritage has gained increasing recognition as a catalyst for social and economic development. This evolution is the consequence of the important changes that the global cultural landscape has faced in the last few decades. From the digital revolution, to the development of new technologies and political events that have caused a series of conflicts or multiple factors which have affected the ecosystem of cultural heritage. On the other hand, natural and material heritage are threatened by anthropogenic actions (e.g. vandalism, conflicts, etc.), geo-hazards and the effects of climate change (e.g. earthquakes, landslides, storms, etc.). Therefore, cultural heritage is currently challenged on two levels: first, to address these threats and strengthen its site protection measures, and secondly, to take advantage of new technologies to stimulate development and dissemination cultural heritage.

Intangible heritage refers to traditions or expressions inherited from ancestors and passed on to descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices regarding nature and the universe, or knowledge and skills for traditional crafts.

Tangible heritage refers to historical buildings and places, monuments, artefacts, etc., which are considered worthy of preservation for the future. These include objects significant to a particular culture's archaeology or architecture, science or technology.

Natural heritage refers to: natural features consisting of physical and biological formations or groups of such formations, which are of outstanding value; Geological and physiographic formations that constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of the vision of science or conservation; Natural sites or natural areas of universal value for science, conservation or natural beauty.

Cultural heritage tells the stories of many peoples of the world. Tangible but also intangible cultural heritage can be subject to certain threats that make it vulnerable.

What are the possible imminent risks to a cultural property? What are the most likely risks? Which of these are expected to cause more and extensive damage? Does the damage differ from one cultural property to another? How can these damages be well understood and assessed? What are the priorities, given the human

capital and available budgets? Which institutions are responsible for cultural sites and museums and how can they work together to prevent and treat risks?

All these questions can be managed through cultural heritage risk management and cultural heritage sustainability.

Risk management can help us answer these questions regarding the conservation and use of cultural heritage. It allows us to consider all risks to prioritize and plan resources better. We can also apply risk management to deal with any situation that requires a comparison between two or more specific risks, involving a dilemma between conservation and sustainability of the environment, cultural heritage elements, etc.

The element of risk can be defined as "the chance that something will happen that will have a negative impact on our goals." Whenever we think about risk, we need to consider both its chance and expected impact.

As far as cultural heritage is concerned, the same concept of risk applies to cultural heritage. Many things can happen that can have a negative impact on heritage collections, buildings, monuments, sites, and our goals for their use and conservation. The impact of the risks in this case is expressed in terms of the estimated loss of the values of the heritage assets.

The types of risks to cultural heritage range from catastrophic (such as major earthquakes, floods, fires and armed conflicts) to gradual and cumulative processes (such as chemical, physical or biological degradation). The result is the loss of values of the heritage asset. For example, if a historic house catches fire there is usually a large or total loss of value to the building and its contents. When the fragile objects of a museum collection are destroyed during an earthquake there is a loss of value in the same collection. Colour fading in traditional textiles exposed to daylight also causes a loss of value. Sometimes the risk does not only involve damage to the heritage asset, but rather the loss of information about it, or the inability to access heritage objects. For example, an archaeological collection or site will lose value if the existing documentation about it disappears.

Heritage managers need to understand these risks well in order to make good decisions about heritage protection (for future generations) while providing accessibility for the current generation.

Due to its importance as a management tool, international standards have been developed, one of which is ISO 31000:2009. As in any field, and with regard to cultural heritage, there are certain stages to consider in the analysis and management of risks that may affect cultural heritage.

2. Understanding the context

In this step, we try to understand all relevant aspects of the context in which the heritage asset is located. This includes physical, administrative, legal, political, socio-cultural and economic environments.

It is also important to identify all the actors, inside and outside the organization, who can help us in the process. Obviously, we need to clearly define our objectives, as well as the scope of the action. It must be clear to everyone what the "patrimonial asset" is. For example, the "heritage asset" could be all the archaeological sites in the country or a specific one or only a certain part of an archaeological site. It could be all the historic museum houses in the city, a particular museum, or just a certain part of a museum's collection.

3. Risk identification

In this step we try to identify all the risks that threaten the cultural heritage (collection, building, monument or site.) It is important not to miss any significant risk. If we are not aware of the various risks affecting our heritage, our decisions and use of resources will be based on an incomplete picture and therefore less effective. When identifying risks, the main question we need to ask ourselves is this: What can cause damage and loss of value to the heritage asset?

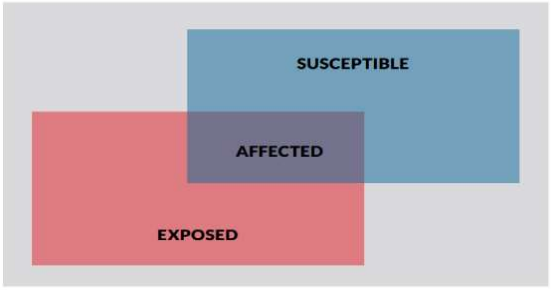
There are several agents that can cause damage and loss of heritage objects:

• physical forces: what types of physical forces can affect me (eg strong winds, earthquakes, improper handling, overcrowding, accidental collisions, visitor traffic, etc.).

human resources, lack of employee training, criminal acts (eg, opportunistic theft, armed robbery, vandalism, terrorist attack, etc.)

• the decay of cultural heritage over time (temperature, UV, pollutants, pests, etc.).

Figure 1. Susceptible heritage vs. affected property



Source: A Guide to Risk Management, Government of Canada, Canadian Conservation Institute, 2016.

In this diagram, the entire heritage asset is represented by the grey rectangle. Suppose that part of it, indicated by the blue rectangle, is susceptible to a certain damage agent. On the other hand, the part of the heritage asset that is exposed to that agent is indicated by the red rectangle. This means that only elements that are both sensitive and exposed to the agent will be affected, i.e. suffer damage and loss of value. For example, wooden objects and buildings are susceptible to termites. They will be affected if exposed to this agent. A metal sculpture displayed outdoors is exposed to direct sunlight. This sculpture will not be affected by light and UV because it is not susceptible to this agent.

4. Risk analysis

Identifying the risks that threaten cultural heritage is necessary but not sufficient if we want to manage these risks effectively. How big are these risks? Which are unacceptable? How can we prioritize them? We need to answer these questions to make effective decisions. The impact of risks on cultural heritage is expressed in terms of the estimated loss of value of the heritage asset.

When risks are of the "event" type, we try to estimate how often they occur. For example, "a major earthquake that damages the heritage asset is expected to occur approximately once every 300 years", "theft of heritage items is expected to occur approximately once every 30 years", " rainwater infiltration through the roof affecting the museum collection is expected to occur approximately once every 3 years' etc. When the risks are of the "cumulative process" type. we try to estimate how quickly the damage will accumulate. For example, 'the total loss of relief decoration on the walls of the archaeological site due to weathering is expected to occur in about 300 years, 'the magnetic tape recordings will have severely degraded and will no longer be accessible in about 30 years ", "colored textiles recently put on display will have a noticeable fading in their most light-sensitive colors in about 3 years, etc.

4.1. ABC scale for risk analysis

A tool has been created to calculate, compare and communicate the extent of risks to cultural heritage. It consists of numerical scales used to quantify the frequency or rate of occurrence and the estimated loss of value for the various risks.

The ABC scale has 3 components. The "A" component quantifies the frequency of the adverse event or rate of occurrence of a process. Components "B" and "C" together quantify the expected loss in value for the heritage asset. The combination of A, B and C defines the magnitude of risk.

A - For "event" risks, this component indicates how often we expect the event to occur, i.e. the average time between 2 consecutive events. For 'cumulative processes', this component indicates how many years it will take for a given level of damage to accumulate.

A-score	How often does the event occur? How many years for accumulating a certain level of damage?
5	~1 year
4 ½	~3 years
4	~10 years
3 ½	~30 years
3	~100 years
2 ½	~300 years

2	~1000 years
1 ½	~3000 years
1	~10000 years
½	~30000 years

Source: Culture and Local Development, OECD 2018 Canadian Conservation Institute, A Guide to Risk Management, Government of Canada

For example, if we expect "a large earthquake to damage the heritage asset, these occur approximately once every 300 years, the A score for this risk would be A=2½.

B - This component indicates the size of the loss in value that we expect for each element of the heritage asset affected by the risk. By "item" we mean an object in a collection, an element of a historic building (eg a facade, the interior decoration of a particular room, a roof, a staircase), a part or a particular feature of a heritage site (eg. a fountain, a burial area, a gate, a set of murals), etc. To estimate the loss of value of the affected objects, one must first visualize the type and extent of damage they will suffer. It then estimates how much this damage represents in terms of loss of value for each item. The loss of value can vary from a total loss to a minimal one.

B-score	Lost value of the affected item (%)	Guidelines
5	100%	Total or near total loss
4 ½	30%	
4	10%	Large loss of value of affected items
3 ½	3%	
3	1%	Little loss of value
2 ½	0,3%	
2	0,1%	Very little loss of value of the items
1 ½	0,03%	
1	0,01%	Negligible loss
½	0,003%	

Source: Culture and Local Development, OECD 2018 Canadian Conservation Institute, A Guide to Risk Management, Government of Canada

C - This component indicates how much of the value of the heritage asset is affected by the risk. Does the risk affect the entire heritage asset, a large part, a small part, a part or only a small part of it? How important is the part of the heritage asset affected by the risk? To score C we estimate the percentage or fraction of the heritage asset, value that will be affected by the risk.

C-score	Percentage of the value of the heritage asset	Guidelines
5	100%	All or nearly all of the value of the asset is affected
4 ½	30%	
4	10%	Much of the property's value is affected
3 ½	3%	
3	1%	A small part of the value of the asset is affected
2 ½	0,3%	
2	0,1%	A very small part of the value of the asset is affected
1 ½	0,03%	
1	0,01%	The affected value of the asset is negligible
½	0,003%	

Source: Culture and Local Development, OECD 2018 Canadian Conservation Institute, A Guide to Risk Management, Government of Canada

For example, suppose that the heritage asset is a historic house museum that contains a collection of furniture, clothing and household artifacts, as well as a historical archive that belonged to the owners of the house. The main purpose of this museum is to preserve and showcase the lifestyle and history of this prominent wealthy family in the region who owned the house and lived there in the 19th century. The house is a unique example of a typical architectural style that cannot be found anywhere else. It is in a very good condition, and most of its construction materials and finishes are original. Most of the furniture, clothing and artefacts show the family's lifestyle at the time that are typical of other wealthy families and therefore similar items can be found elsewhere. In fact, some of the artifacts on display are modern copies of original items that can no longer be displayed due to their poor condition. The only real "treasure" among the objects of the museum collection is a unique set of five vases decorated with exceptional aesthetic quality made by a nationally famous craftsman of that time. In the archive we can find letters of correspondence with family members who lived abroad, a small collection of illuminated manuscripts and some rare business documents that bear witness to the history of trade in the region. After scoring the three components of each risk using the ABC scales, we can calculate the magnitude of the risk (MR), i.e. its potential to cause loss of value to the heritage asset. This calculation is done by adding the scores of the 3 risk components:

$$A + B + C = MR$$

4.2. Case study The fortified church of Biertan. Risk analysis.

Biertan is part of the first German settlements in Transylvania, being included in the two "Seats" Mediaș and Șeica - in the Andreeana Diploma from 1224. Biertan is mentioned in a document for the first time in 1283, together with other villages, inhabited at that time by Saxons in - a document regarding the taxes required by the Catholic Capital of Alba-Iulia from the Catholic priests in the Saxon communities. Like any Saxon settlement, it had an urban organization, the Franconian style of rows of houses around a central square, above which rises an imposing fortress church, stands out. Among the total of almost 3 fortified churches built between the 15th and 16th centuries, the church in Biertan has preserved its original appearance very well.

The door of the sacristy, with a complicated system of 19 locks, was made by local craftsmen in 1515 and was awarded at the World Exhibition of 1900 in Paris. It is a representative example of medieval Saxon manufacture, thanks to the inlays and the original closure system, which still works today. The surrounding fortifications are considered the strongest in Transylvania, from a peasant fortress. It has three rows of walls, 6 towers and 3 bastions built in different stages starting from the 14th century. At the top it has a defense corridor, the clock and the bells. The "mausoleum" tower is located to the northeast and has a mausoleum on the ground floor that houses, since 1913, the graves of the prelates of this church.

The slabs were made by Nikolaus Elias from Sibiu. The Catholic tower, located on the southern side, housed the chapel reserved for non-reformation Catholics. There is an organ in the church, the oldest information about it dates from 1523, when the organist Bartholomäus is mentioned. After several restorations, we arrived at the organ that exists today, with 1290 pipes, 2 keyboards, a pedal board and 25 registers, which dates from 1869 and was made by master Carl Hesse from Vienna.

The maker of the pulpit seems to be a Ulrich stonecutter, originally from Brasov, who arrived in 1523 in Biertan. The wood painting of the pulpit dates from 1754. The pulpit impresses with the representations of biblical scenes and the decoration with particularly neat architectural and plant motifs worked in the transitional style from the Gothic to the Renaissance. The same artist who made the pulpit of the church, Johannes Reichmuth from Sighisoara, is the author of the special gate of the sacristy.

In the risk analysis, we will consider one risk from each category mentioned above. There are several agents that can cause damage and loss of heritage objects:

• physical forces: what types of physical forces can affect me (eg. strong winds, earthquakes, improper handling, overcrowding, accidental collisions, visitor traffic, etc.).

• human forces lack of training of employees, criminal acts (for example, opportunistic theft, armed robbery, vandalism, terrorist attack, etc.)

• the decay of cultural heritage over time (temperature, UV, pollutants, pests, etc.)

Applying the ABC Scales in terms of risk management in the case of the Church of Biertan, we can reach the following conclusions:

A-For "event" risks, this component indicates how often we expect the event to occur, i.e. the average time between 2 consecutive events.

If we consider a major event such as an earthquake or a fire, the statistics show us that these events are quite rare.

A large fire is a "rare event" risk for a museum. National statistics from various countries show that the average interval between major fire events for museums with basic fire control measures is about 300 years. By basic control measures, we mean: local smoke alarms and portable fire extinguishers properly positioned, in sufficient number, inspected, tested and regularly tested; a telephone line and a fire station available full time. Also, the area of southern Transylvania is not currently affected by high-magnitude earthquakes, therefore, using the scalar table, we can identify an A score of 2 ½ for the rare risks of the church in Biertan. (see table) (This does not mean that it occurs exactly every 300 years. From the perspective of our decision, it may be more useful to express it as a 10% chance every 30 years.)

B- This component indicates the size of the loss in value that we expect for each element of the heritage asset affected by the risk. By "item" we mean an object in a collection, an element of a historic building (eg. a facade, the interior decoration of a particular room, a roof, a staircase), a part or a particular feature of a heritage site (eg. a fountain, a burial area, a gate, a set of murals), etc. To estimate the loss of value of the affected objects, one must first visualize the type and extent of damage they will suffer. It then estimates how much this damage represents in terms of loss of value for each item.

Considering that there are many wooden elements in the church (floors, ceilings, stairs, roof framing, doors, windows, picture altar), as well as the church tower which is made of wood, these are combustible materials that can be subject to a total loss or almost the total value of each element of this heritage asset affected by the fire (building and objects). The effects of fire refer to the partial or total collapse of the building, the burning of parts of the building and its contents. An earthquake would also have devastating effects on the stone construction of the church, foundation, walls, statues inside that could break, etc. The B score in this case would be B=5.

The C score indicates how much of the heritage asset's value is affected by the risk. Does the risk affect the entire heritage asset, a large part, a small part, a part or only a small part of it? How important is the part of the heritage asset affected by the risk?

To score C we estimate the percentage or fraction of the heritage asset, value that will be affected by the risk.

Given the characteristics of the building and its contents, we expect that most of this heritage asset and its value would be affected in the event of a major fire or earthquake. The C score in this case would be C=5.

Magnitude of Risk (MR)

The magnitude of the risk is MR=12½(2½+ 5 + 5).

To summarize: if a major event (fire or earthquake) will occur in the church, once every 300 years on average (A=2½), which means a 10% chance. every 30 years, fire or earthquake will affect all or most of the value of the heritage asset (C=5) causing total or near total loss of value of each affected item (B=5).

If we refer to the second category of risks (human forces, lack of employee training, criminal acts (for example, opportunistic theft, armed robbery, vandalism, terrorist attack) then the conclusions will be different.

Thefts or attacks originating from wars or other human actions are considered to have a higher probability of occurrence, especially in the current context, where we could witness important losses of Ukrainian cultural heritage in the context of the war.

Regarding human-caused actions such as theft or armed attack, the A score for the church in Biertan would be 4 and 3 ½ respectively.

The B score that we have seen shows us the size of the loss of value that we expect for each element of the heritage asset affected by the risk, we assume that the theft of a statue or painting would involve almost total or partial loss of the respective heritage elements, if we consider calculate a possible recovery. Also in case of war. Score B= 4 ½

The C score tells us how much of the heritage asset's value is affected by the risk. In this case, the score C= 4 ½, with an estimate of the percentage or fraction of the heritage asset, value that will be affected by the risk of 30%-40%.

Magnitude of Risk (MR)

The size of the theft risk is MR=10 ½(4½+ 3+3).

Size of war risk: MR= 13 ½(3½+ 5 + 5).

To summarize: we expect a theft event to occur once every 3 years for an average of 10 years (A=3½), which means a 30% chance. And the risk will partially or to a small extent affect the value of the heritage asset (C=3) causing the partial or no loss in some cases of the elements of the heritage asset (B=3), if it is recovered.

In the event of a terrorist attack or war, once every 30 years on average (A=3½), the Fire Risk will affect all or most of the value of the heritage asset (C=5) causing total or near total loss of value of each affected element (B=5).

5. Conclusions

Risk management, also, in the case of cultural heritage involves the identification and assessment of risks, the identification and establishment of the response to the risk in order to reduce the possibility of the defense of the risks, as well as the reduction of the consequences produced, as a result of the materialization of the risks. The risks affecting the built cultural heritage are different from the risks associated with the intangible cultural heritage which are more aimed at the loss over time of traditions and customs, of national identity or other elements related to the specificity of an area. Built heritage, once gone, cannot be brought back. As a good practice, the preservation of cultural and natural heritage should be part of the design of every project/program, and the benefits resulting from the use of cultural heritage should be reflected on as many members of the community as possible.

In the context of sustainable cultural tourism, the involvement of civil society is equally important for the maintenance, transmission and management of cultural heritage and for the sustainable management of the place for economic tourism activity.

The main interested parties for the development of sustainable cultural tourism at the national level are:

- Government (public sector);
- Local and heritage communities (community);
- Cultural heritage (religious heritage, organizations, institutions, sites, practices);
- Tourism associations (operators, developers, entrepreneurs);
- Tourists (consumers)

In order to develop sustainable cultural tourism, local and regional planners must consider the impact of climate change and the surrounding natural environment. It, also, means that other players such as local communities, politicians, organizations, cultural institutions and authorities must be integrated into the process. Entrepreneurs produce and offer cultural products, services and cultural experiences.

The ultimate aim of risk management is to help heritage professionals and organizations responsible for collections, buildings, monuments and sites to achieve their objectives in a more controlled and successful way. This means both optimizing the conservation of these heritage assets and optimizing their benefits to society over time. By assessing the risks affecting our collections, buildings, monuments and sites in their specific context, we can make more effective decisions about the sustainable use and safe keeping of heritage assets.

References:

[1] Geographical Indications under European Union Law. Current Issues and Future Plans for Strengthening the Protection of Geographical Indications, C Budileanu - Rom. J. Intell. Prop. L., 2021 – HeinOnline

[2] Community Empowerment Models of Tourism Village Based on Superior Commodities: Realizing Economic Resilience, AE Cahyono, MU Kurniawan, S Sukidin - Journal of Distribution, 2018

[3] Bristow, G., Healy, A., (2014). Building Resilient Regions: Complex Adaptive Systems and the Role of Policy Intervention, în Raumforsch Raumordn

[4] Cultural Heritage as Economic Value: Economic Benefits, Social Opportunities and Challenges of Cultural Heritage for Sutainable Development, Athenns, 2017

[5] Culture and Local Development, OECD 2018 Canadian Conservation Institute, A Guide to Risk Management, Government of Canada

[6] Culture Statistics Eurostat.