

## **Approach to Preparedness and Risk Management for the UNESCO World Heritage Property ‘Old City of Dubrovnik’**

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The City of Dubrovnik is the first city in Croatia to prepare a UNESCO World Heritage Management Plan aimed at its protected historic city core, i.e., the Old City of Dubrovnik. Besides being a World Heritage Property (WHP), Dubrovnik’s historic core is also home to more than 1500 residents, making it a ‘living city’. One of the important issues emphasised by the Management Plan are natural and anthropogenic risks for both cultural heritage and ‘living city’. This work aims to present a means of developing a methodology and various aspects to be considered in elaborating the preparedness and risk management for the UNESCO WHP in Dubrovnik as a necessary part of implementing the *Management Plan for UNESCO WHP ‘Old City of Dubrovnik’*. In the development process, a participatory approach is highlighted as an essential methodological tool for involving local communities in co-creating content and raising awareness of the importance of living heritage and the anthropogenic impacts on climate change.

Keywords: Dubrovnik, UNESCO, world heritage property, risk management, climate change

### **Approche de la Prparation et de la Gestion des Risques pour le bien du Patrimoine Mondial de l’UNESCO ‘Vieille Ville de Dubrovnik’**

La ville de Dubrovnik est la premire ville de Croatie  prparer un plan de gestion du patrimoine mondial de l’UNESCO visant son cur historique protg, c’est--dire la vieille ville de Dubrovnik. En plus d’tre un bien du patrimoine mondial (BPM), le cur historique de Dubrovnik abrite galement plus de 1500 habitants, ce qui en fait une « ville vivante ». L’une des questions importantes soulignes par le plan de gestion sont les risques naturels et anthropiques pour le patrimoine culturel et la « ville vivante ». Ce travail vise  prsenter un moyen de dvelopper une mthodologie et divers aspects  prendre en compte dans l’laboration de la prparation et de la gestion des risques pour le BPM de l’UNESCO  Dubrovnik en tant que partie ncessaire de la mise en œuvre du plan de gestion du BPM de l’UNESCO « Vieille ville de Dubrovnik ». Dans le processus de dveloppement, une approche participative est mise en vidence comme outil mthodologique essentiel pour impliquer les communauts locales dans la co-cration de contenu et la sensibilisation  l’importance du patrimoine vivant et des effets anthropiques sur le changement climatique.

Mots-cls: Dubrovnik, UNESCO, patrimoine mondial, gestion des risques, changement climatique

### **Enfoque de la Preparacin y la gestin de Riesgos para la Propiedad del Patrimonio Mundial de la UNESCO ‘Ciudad Vieja de Dubrovnik’**

La ciudad de Dubrovnik es la primera ciudad de Croacia en preparar un Plan de gestin del Patrimonio Mundial de la UNESCO dirigido a su ncleo histrico protegido, es decir, la Ciudad Vieja de Dubrovnik. Adems de ser Patrimonio de la Humanidad (WHP), el centro histrico de Dubrovnik tambin alberga a ms de 1500 residentes, lo que la convierte en una "ciudad viva". Una de las cuestiones importantes que destaca el plan de gestin son los riesgos naturales y antropognicos tanto para el patrimonio cultural como para la "ciudad viva". Este trabajo tiene como objetivo presentar un medio para desarrollar una metodologa y varios aspectos a ser considerados en la elaboracin de la preparacin y la gestin de riesgos para la WHP de la UNESCO en Dubrovnik como parte necesaria de la implementacin del Plan de gestin de la PTH de la UNESCO "Ciudad Vieja de Dubrovnik". En el proceso de desarrollo, se destaca un enfoque participativo como una herramienta metodolgica esencial para involucrar a las comunidades locales en la co-creacin de contenido y concienciar sobre la importancia del patrimonio vivo y los efectos antropognicos sobre el cambio climtico.

Palabras clave: Dubrovnik, UNESCO, patrimonio mundial, gestin de riesgos, cambio climtico

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## Introduction

The historic city core of the City of Dubrovnik – the ‘*Pearl of the Adriatic*’; is a protected UNESCO World Heritage Property (WHP). Dubrovnik’s urban core is a masterpiece of human creativity and one of the most characteristic and preserved examples of mediaeval urban planning, with outstanding artistic and architectural achievements. Although facing depopulation like many other European historic city cores, the protected core of Dubrovnik is still a living urban body and the heart of the city. At the same time, its residents are fellow heirs and carriers of Dubrovnik’s living heritage (Klempić Bogadi, Vukić and Čaldarović, 2018). Its outstanding universal value (OUV) was acknowledged in 1979 with its enlistment on UNESCO’s World Heritage List as the UNESCO WHP ‘Old City of Dubrovnik’ (UNESCO WHC, 1979).<sup>(1)</sup> Moreover, at the beginning of 2021, the *Management Plan for UNESCO WHP ‘Old City of Dubrovnik’ (2021)* (hereinafter: *WHP Management Plan*) was adopted to protect, preserve, and sustainably manage the WHP and its buffer zone.



Figure 1. UNESCO WHP ‘Old City of Dubrovnik’ and its buffer zone © own elaboration

Moreover, at the beginning of 2021, the *Management Plan for UNESCO WHP ‘Old City of Dubrovnik’ (2021)* (hereinafter: *WHP Management Plan*) was adopted to protect, preserve, and sustainably manage the WHP and its buffer zone.

The development of the preparedness and risk management system was recognised as a prerequisite for future management of the WHP ‘Old City of Dubrovnik’. In the context of preservation and valorization of cultural heritage, the issue of natural and anthropogenic risk management is a constituent of UNESCO’s *Operational*

*Guidelines for the Implementation of the World Heritage Convention* (UNESCO WHC, 2019) and *Recommendation on the Historic Urban Landscape* (UNESCO, 2011). Numerous authors have integrated elements of risk management into academic literature addressing the preservation of cultural heritage. This became fundamental for the development of modern concepts of cultural heritage management. (Feilden, 1987; Stovel, 1998)

## Dubrovnik Risk Issues Overview

The City of Dubrovnik, its buffer zone, and setting (surrounding) are significantly endangered by natural and anthropogenic risks, where the risks of potential earthquakes, fires, floods, and the consequences of climate change have been identified the most in the history of data collection and monitoring. Furthermore, throughout its history, Dubrovnik has suffered numerous catastrophic events. All these identified risks should be considered in planning risk preparedness in the WHP and its wider setting.

As stated earlier, the Dubrovnik area and its wider setting have a high seismic risk. Thus, its infrastructure and construction facilities ought to be continuously adjusted to earthquakes. However, the unpredictability of earthquakes makes it a painstaking task. According to the seismic data collected so far, the wider area of Dubrovnik-Neretva County has a high

1. Since then, the spatial coverage of the WHP ‘Old City of Dubrovnik’ has been slightly expanded (UNESCO WHC, 1994). Likewise, in 2018, the Republic of Croatia has submitted a proposal for minor changes in the buffer zone boundaries. This request is still pending (UNESCO WHC, 2018).

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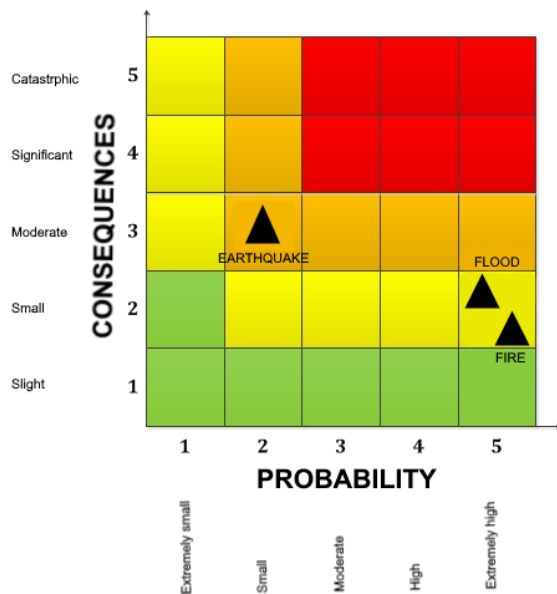


Figure 2. Risk assessment for the City of Dubrovnik  
© ‘Risk assessments of major accidents for the City of Dubrovnik’, 2018

probability of earthquake occurrence that can reach high seismic intensity, i.e., VIII° to IX° according to the MSK scale (‘Seismological map of the Republic of Croatia’, 2021). The city has already experienced the strength of seismic events, most severely in the 1667, 1979, and 1996 earthquakes. Since the 1979 earthquake, the Institute for Reconstruction of Dubrovnik has been carrying out seismic rehabilitation of buildings in the historic core under UNESCO protection (‘Risk assessments of major accidents for the City of Dubrovnik’, 2018).

Apart from earthquakes, fires represent a very high natural and anthropomorphic risk. According to the ‘Risk Assessments of Major Accidents for the City of Dubrovnik’ (2018), the probability of fire is very high, and the damage can be fierce. Moreover, fire occurrences are most

closely related to human misconduct. This risk is especially linked to restaurants and catering facilities in the historic city core. However, fire hazards can also be external, occurring outside the historic city core. Said fire risks are exceptionally high during dry and extremely hot summer seasons. The duration and intensity of such climate conditions have increased in the last decade due to global climate change.

Furthermore, the specific risk of flooding in the historic core of Dubrovnik occurs due to the large amount of rainwater that the sewage and drainage systems cannot absorb in a short time. Thus, there is an overflow hazard in the lowermost parts, such as in Stradun Street and in front of the Rector’s Palace. Huge amounts of rainfall can lift the manholes and flood the ground floors and basements. In addition to this risk, there are risks of torrents and sedimentation in the wider area of the city, as well as the contamination of drinking water. The consequences of the flood risk are relatively small; however, their probability is extremely high (‘Risk assessments of major accidents for the City of Dubrovnik’, 2018).

Another threat to the UNESCO WHP ‘Old City of Dubrovnik’ and its OUV features is excessive tourism (over-tourism), especially cruising, which puts pressure on the cultural property. This is also an environmental issue. Hence, in 2015, UNESCO issued a *Report on the UNESCO-ICOMOS reactive monitoring mission to Old City of Dubrovnik, Croatia from 27 October to 1 November 2015*, demanding the reduction of the cruising tourism receiving capacity to 8,000 people per day (UNESCO WHC, 2015).

### Preparedness and Risk Management in Dubrovnik

Considering that the area of the City of Dubrovnik as a whole, but especially the UNESCO World Heritage Site, has a high degree of potential threats from natural and anthropogenic risks, the *Management Plan for UNESCO WHP ‘Old City of Dubrovnik’* (2021) envisages the development of the Preparedness and Risk Management Plan. To elaborate a

comprehensive and well-structured management plan for the WHP, a participatory approach was used to involve all relevant local stakeholders and the local community in developing the strategic framework of the Plan. This enabled a holistic analysis and resulted in a quality Management Plan covering all aspects and issues of managing a WHP. Thus, such methodology should be implemented in designing and developing the Preparedness and Risk Management Plan. Cooperation between all involved stakeholders and relevant actors is likewise essential for delivering an effective management document.<sup>(2)</sup>

It was determined to approach unified risk management and define the steps needed to increase the level of preparedness for protecting the inscribed UNESCO WHP ‘Old City of Dubrovnik’ and its setting. The development of such a document must be in parallel with the relevant guidelines of competent international bodies for cultural heritage such as UNESCO, ICOMOS, and ICCROM. These are, among others, *Guide to the Methodological Study of Monuments and Causes of their Deterioration* (De Angelis d’Ossat, 1982), *Risk Preparedness: A Management Manual for World Cultural Heritage* (Stovel, 1998), *Management Guidelines for World Cultural Heritage Sites* (Stovel and Jokilehto, 1998) and *Between Two Earthquakes – Cultural Property in Seismic Zones* (Feilden, 1987). In addition, since certain anthropogenic risks represent threats to the environment, documents in question should follow the ‘Five C’s’ of the *UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage* (UNESCO, 1972), striving to establish the balance between human interaction with natural and cultural heritage and their preservation.

Risk management consists of three main phases, i.e., before, during, and after risk activation. The analysis of the city’s risk preparedness encompasses activities including risk assessment, prevention measures, and mitigation of specific hazards (maintenance, monitoring, formulation, and implementation of various risk management policies and programmes, etc.), while the development of emergency preparedness before risk activation comprises measures such as the creation of emergency teams, the development of warning and exercise systems, the development of evacuation plans, the clear marking of evacuation routes, temporary shelters, etc. During the preparation of the document, it is necessary to integrate all segments of risk management, such as risk reduction, strengthening preparedness, and defining responses in case of risk activation and recovery from potential damage caused by risk activation (‘Management Plan for UNESCO WHP ‘Old City of Dubrovnik’’, 2021). Therefore, the development of the document should consider:

- all types of threats as well as identification of possible threats to the UNESCO WHP ‘Old Town of Dubrovnik’,
- the analysis of the vulnerability of the WHP (or its components), including the buffer zone and the setting (surroundings),
- the assessment of the potential impact of identified threats, measures to reduce risk and/or strengthen resilience, and
- measures to respond and recover in the event of risk activation.

As illustrated earlier (in Figure 2), the Dubrovnik WHP is exposed to many risks. Regarding the development of the Management Plan, it is necessary to present in advance all possible risks that may occur and organise a series of activities that would provide possible protection and increase the resilience of the WHP and stability in a risky situation. In addition to physical components of outstanding universal value, it is necessary to consider

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2. Preparedness and risk management documents and systems used in England, France, Netherlands, Switzerland and Italy can serve as examples of good practices of the holistic approach and well-operated response activities. (Stovel, 1998)

the intangible values and aspects of cultural heritage associated with the historic core of Dubrovnik. Likewise, the examined area of the Preparedness and Risk Management Plan ought to include the WHP’s buffer (contact) zone with the urban setting. It should be kept in mind that most risks are external and connected to a spatial area of potential action. In other words, the WHP should be assessed in a wider geographical context. This is mainly related to integrating climate change adaptation measures. Dubrovnik cannot directly change the effects of climate change. Nonetheless, changing certain urbanistic elements in its surroundings and stimulating green infrastructure and nature-based solutions (NBS) can reduce the negative impact on the micro-level (e.g., heat islands). Such activities should be focused on the buffer zone since strict and inflexible protection and preservation acts on heritage property constrain changes.

Given the latent danger of earthquakes and fires, preparedness and evacuation plans need to be harmonised with existing building structures, e.g., fireproof wooden roofs, buildings of damaged construction and load-bearing stone walls, occupancy of individual assemblies, the flow of streets, the existence of a hydrant network, etc. Therefore, all plans to mitigate potential risks should be made in cooperation with the Institute for Reconstruction of Dubrovnik, where the necessary data is available. The WHP Management Plan highlighted the need to strengthen the knowledge base on earthquake risk, mainly because the national system and network of seismographs are outdated and inconsistent with modern standards (‘Management Plan for UNESCO WHP ‘Old City of Dubrovnik’’, 2021). It is necessary to continue the activities of the Seismological Institute and the Institute for Reconstruction of Dubrovnik to find adequate facilities and locations for permanent seismographs so that seismic activity can be monitored and regularly reported to the local government and the Institute for Reconstruction of Dubrovnik. This data should be used in long-term plans to mitigate potential earthquake damage. Earthquakes, for example, cannot be stopped. However, the damage could be reduced by adjusting infrastructure and educating residents to increase resilience.

Likewise, according to the WHP Management Plan, reconstruction plans ought to be aligned with planned evacuation corridors (‘Management Plan for UNESCO WHP ‘Old City of Dubrovnik’’, 2021). Furthermore, the city must be equipped with adequate infrastructure enabling quick response and the implementation of protection measures (water flows with sufficient extinguishing pressure, infrastructural accessibility to fire and other emergency vehicles, etc.). It is also necessary to adjust the storm water and wastewater drainage infrastructure to avoid and mitigate flood risk. Therefore, the Preparedness and Risk Management Plan must identify and evaluate evacuation routes and establish an evacuation plan, which is particularly important in the response phase to potential risk activation.

Considering the impact of human activities, specifically those regarding tourism, it is important to include monument and environmental deterioration risks due to excessive tourism in planning the risk management system.

The vulnerability issue is relevant to the condition of individual buildings and the ability of owners or tenants to bear the risks associated with their property within its environment. Vulnerability is also a matter of the overall environmental context, which includes both urbanised and natural areas. For this reason, it is essential to connect the local community with experts on natural and anthropogenic risks and educate and strengthen the knowledge of the public and stakeholders on the matter. Everyone living in the historic core of Dubrovnik should be aware of the procedures if a risk arises.

Additionally, it is necessary to functionally strengthen and enhance the capacities of the Institute for Reconstruction of Dubrovnik for various aspects of monitoring and risk management. The institute was established after the 1979 earthquake to manage the reconstruction of the city. The WHP Management Plan identified it as the main coordinator of the Preparedness and Risk Management Plan.

## **Conclusion**

The invaluable historic city core of Dubrovnik, the ‘Old City of Dubrovnik’, has been on the UNESCO World Heritage List for more than 40 years now. Collecting data and monitoring accidents and potential threats has enabled the identification of all known risks and the assessment of their probability and severity. According to historical data and the assessment, the UNESCO WHP ‘Old City of Dubrovnik’ has the highest risk of earthquakes, fires, floods, and the consequences of climate change.

Many natural risks are often perceived as an occasional ‘inevitability’ as we cannot predict them (e.g., earthquakes) either in terms of occurrences or in terms of intensity and potential consequences. However, for such risks, it is necessary to establish a unique concept of mitigation. Although earthquakes, for example, cannot be prevented or predicted, infrastructure can still be adequately strengthened, evacuation plans prepared, and seismic activities monitored. Similar actions can be taken to mitigate fires and floods as well. Moreover, to reduce potential damages, it is necessary to foster capacity building, cooperation among all involved stakeholders and actors, and education of the local community on possible natural and anthropogenic risks and procedures if one should occur. Concerning the latter, developing ways and means to address ongoing risks can also contribute to mitigation. If a situation arises, it is necessary to determine suitable actions and how to achieve them with respect to the protection and preservation principles of the world heritage sites. Thus, it is crucial to have knowledge-base networks and effective knowledge transfer.

In addition to anthropogenic risks, the impact of mass tourism, especially cruising, ought to be likewise considered. Intense and unregulated tourist flows are both an issue of protection and conservation of cultural heritage and an environmental problem. Moreover, the consequences of climate change, like droughts, are becoming increasingly visible. They pose a significant risk to the future protection, preservation, and valorization of the ‘Old City of Dubrovnik’. It will take time to integrate climate change adaptation measures to create an adequate level of resilience.

Finally, the above-mentioned aspects should be considered and included in the elaboration of the Preparedness and Risk Management Plan that was recognised as a prerequisite for future management of the WHP ‘Old City of Dubrovnik’. This document will be enacted within the implementation of the Management Plan for UNESCO WHP ‘Old City of Dubrovnik’. Such a process will be in line with the current cultural and natural heritage management and documents of heritage umbrella organisations such as UNESCO, ICOMOS, and ICCROM, while the primary methodological tool in elaborating the document should be a participatory approach. Consequently, a comprehensive Preparedness and Risk Management Plan will result from a holistic examination of the examined area, thereby protecting both natural and cultural heritage and saving lives.

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