

**UNESCO designated sites – natural and cultural heritage sites as  
platforms for awareness raising**

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## **UNESCO's role in Disaster risk reduction**

United Nations Educational, Scientific and Cultural Organization (UNESCO) is a specialized agency of the United Nations. UNESCO's aim is "to contribute to the building of peace, the eradication of poverty, sustainable development and intercultural dialogue through education, the sciences, culture, communication and information".

UNESCO pursues its objectives through five major programs: education, natural sciences, social/human sciences, culture and communication/information. Global actions lead by UNESCO include literacy, technical, and teacher-training programs, international science programs, the promotion of independent media and freedom of the press, regional and cultural history projects, the promotion of cultural diversity, translations of world literature, international cooperation agreements to secure the world's cultural and natural heritage.

UNESCO has been strongly involved in disaster risk reduction (DRR) since the 1960s with studies on earthquakes and oceanography. Its programme has since expanded into other categories of hazards and many areas as it pursues multidisciplinary actions to study natural hazards and mitigate their effect.

In the 1990-2000s, UNESCO kept supporting natural hazard-related studies and mitigation activities during the International Decade for Natural Disaster Reduction (IDNDR) proclaimed by the United Nations (Clayson, 1991).

UNESCO promotes scientific exchange and collaborative efforts in order to establish effective early warning systems for different hazards such as tsunamis, landslides, volcanoes, earthquakes, floods and droughts. UNESCO helps Member States to collectively achieve effective early warning and hazard-monitoring, helps coordination between existing research centers and educates communities at risk about preparedness measures, including setting up warning and emergency response Standard Operating Procedures and community drill exercises. UNESCO promotes community-based approaches in the development of response plans and awareness campaigns, which strongly involve educational institutions and local community actors.

The scientific and technical work in disaster reduction is essentially promoted by the four Organization's International and Intergovernmental Science Programmes, namely the International Geoscience and Geoparks Programme (IGGP) (UNESCO, 2018a), the Man and Biosphere (MAB) Programme (UNESCO, 2018b), the programmes of the Intergovernmental Oceanographic Commission (IOC) (IOC-UNESCO, 2018) and the

International Hydrological Programme (IHP) (UNESCO, 2018c). A cross-sectoral group working on Disaster Risk Reduction serves to coordinate the organization's work on DRR (UNESCO, 2018d).

## **UNESCO designated sites**

UNESCO hosts Secretariats of three international programmes dealing with designations of sites of international value. These three programmes are the International Geoscience and Geoparks Programme (IGGP), the Man and the Biosphere Programme (MAB) and the World Heritage Convention. Each programme operates accordingly with UNESCO Global Geoparks, Biosphere Reserves and World Heritage Properties.

UNESCO Global Geoparks are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. Their bottom-up approach consist of combining conservation with sustainable development while involving local communities. As of July 2018, there are 140 UNESCO Global Geoparks in 38 countries.

Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use. Biosphere reserves are 'Science for Sustainability support sites' – special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity. As of July 2018, there are 686 sites biosphere reserves in 122 countries, including 20 transboundary sites.

A World Heritage property is a landmark or area which is selected as having cultural, historical, scientific or other form of significance, and is legally protected by international treaties. The sites are judged important to the collective interests of humanity. To be on the world heritage list, sites must be of 'outstanding universal value' and meet at least one out of 10 selection criteria. As of July 2018, 1092 sites are listed: 845 cultural, 209 natural, and 38 mixed properties in 167 states.

## **Natural hazards at UNESCO designated sites**

UNESCO-designated sites are located in geographical settings which may be partly or entirely exposed to natural hazards and extreme weather events, with potential impacts on the communities living in or near the

sites, and on their livelihoods. Because of their high cultural and symbolic value, the impact of the loss or damage of a UNESCO-designated site can resonate across the world.

In recent years, natural hazards, both geological (such as earthquakes, volcanic eruptions, landslides and tsunamis) and hydro-meteorological (such as floods, droughts and avalanches), have already caused extensive damage to UNESCO-designated sites. Major earthquakes devastated WH sites in the Kathmandu Valley, Nepal, in 2015, and disrupted the functioning of the Wolong BR in Sichuan, China, in 2008. Many UNESCO sites, such as the Volcanoes of Kamchatka WH site in Russia, the Katla UNESCO Global Geopark in Iceland and the Tacaná Volcano BR in Mexico, have experienced significant volcanic eruptions, damaging infrastructure and natural environment. Different types of landslides frequently occur on the slopes surrounding such sites as the Machu Picchu WH site or Nanda Devi BR, damaging access roads and tourist paths. Many sites face a high flooding risk, as revealed by heavy floods in the past decade in Bangladesh (Sundarbans WH site), Canada (Waterton BR), France (Camargue BR), Slovenia (Idrija UNESCO Global Geopark) and many other regions. Multiple designated sites are no exception. For instance two existing triple designated sites, Mont-Perdu, France and Spain, and Jeju, South Korea, are exposed to various hazards, such as landslides and avalanches for Mont-Perdu and tsunamis and wildfires for Jeju island.

UNESCO assists Member States and its designated sites in strengthening livelihood capacities in DRR. UNESCO encourages the identification of risks, protection from different hazards, as well as fostering climate change resilience, and the preservation of UNESCO-designated sites and their communities. UNESCO continuously contributes to building capacity in DRR (UNESCO et al., 2010), developing innovative policy (UNESCO, 2015), tailoring management strategies (UNESCO, 2017), and recognizing the value of resilient protected area systems (GGN, 2012; UNESCO, 2016).

## **Global assessment of exposure to risks at UNESCO designated sites**

In 2017, UNESCO DRR experts undertook a global assessment, aiming to overview disaster risk reduction at UNESCO-designated sites, in particular to provide qualitative information concerning the global exposure of UNESCO-designated sites to, and the awareness of their site managers of, natural hazards.

The preparatory step was the creation of a united geospatial database of all 1901 UNESCO designated sites. The database consolidated the information on each site's general description (name, country, criteria of

inscription, etc.) as well as its spatial location. Further work was then undertaken to add to the database all available information on disaster risk reduction issues, including exposure and vulnerability to risks, current experience on prevention and mitigation measures, awareness raising activities and site managers' needs.

An open-source database coming from the Global Risk Data Platform (GAR, 2013), a multi-agency effort to share spatial information on global risk from natural hazards, was used to estimate exposure to main natural hazards. The four following datasets were used in the study: (i) the estimate of the annual physical exposure to landslides triggered by earthquakes and precipitation events, (ii) the annual physical exposure to earthquakes, (iii) the annual physical exposure to floods and (iii) the annual average physical exposure to wildfires. All four datasets were modelled using global data and aggregated to ~ 5 km resolution for distribution. The spatial database of UNESCO designated sites was associated with datasets containing information about risk exposure to one of four main hazards – tsunamis, landslides, earthquakes and floods (Pavlova et al., 2017). If the site location intersected with a positive raster value of one of the hazards, this site was assumed to be potentially exposed to the hazard in question.

Further evaluation of DRR issues started through the analysis of site managers awareness. Each UNESCO site designation has its own monitoring system, thus different approaches, including thematic surveys, published literature and reports, were used. For the World Heritage sites, the online database of Periodic Report Cycle 2 (PR-II, 2008-2015) includes a series of questions concerning the management organization as well as “Factors Affecting the Property” whereby WH site managers are asked to provide information on the range of factors that affect the property. Subsections 3.10 “Climate Change and severe weather events” and 3.11 “Sudden ecological or geological events” of the questionnaire contain questions about main natural hazards (Climate Change: storms, flooding, droughts, desertification, changes to oceanic waters, temperature change; Geohazards: volcanic eruptions, earthquakes, tsunamis, avalanches/landslides, erosion and wildfires) affecting or not WH sites.

Such information is not yet included in the monitoring process of UNESCO Global Geoparks as well as Biosphere Reserves. Thus, UNESCO's Section on Earth Sciences and Geo-Hazards Risk Reduction has launched a detailed questionnaire addressed to all UNESCO Global Geopark and Biosphere Reserves site managers in April 2015. This on-line multi language questionnaire is available at the following dedicated UNESCO webpage:

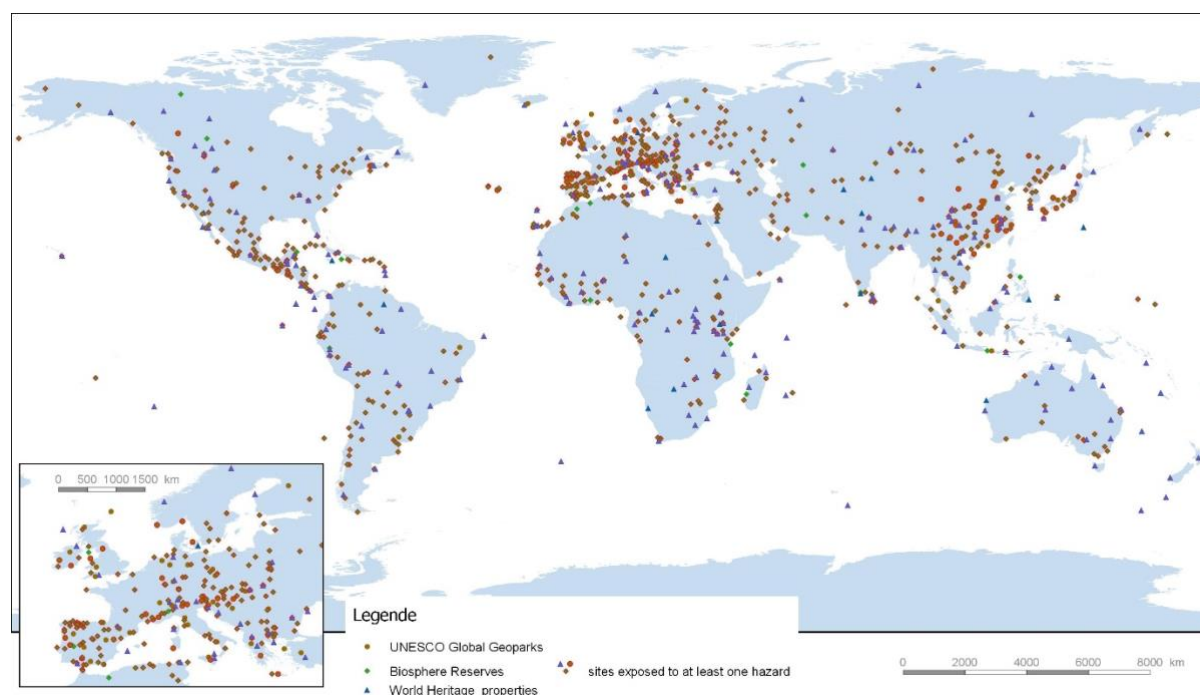
<https://www.socisurvey.de/naturlhazardsunescosites/>. 10 minutes survey includes a series of closed and open questions on (i) exposure, (ii) risk and (iii) awareness raising activities on natural hazards at these natural sites. By

the beginning of 2019, 103 questionnaires from UGG site managers and 379 feedbacks from BRs sites were received.

The information for all UNESCO designated sites coming from sources described above were stored in one georeferenced database and analysed using descriptive statistics.

Results of both global exposure and awareness assessments reveal that 92% of UNESCO designated sites could be potentially exposed to at least one out of the main natural hazards (Fig. 1). In particular, 94% of BRs, 96% of UGGps and 85% of WH sites.

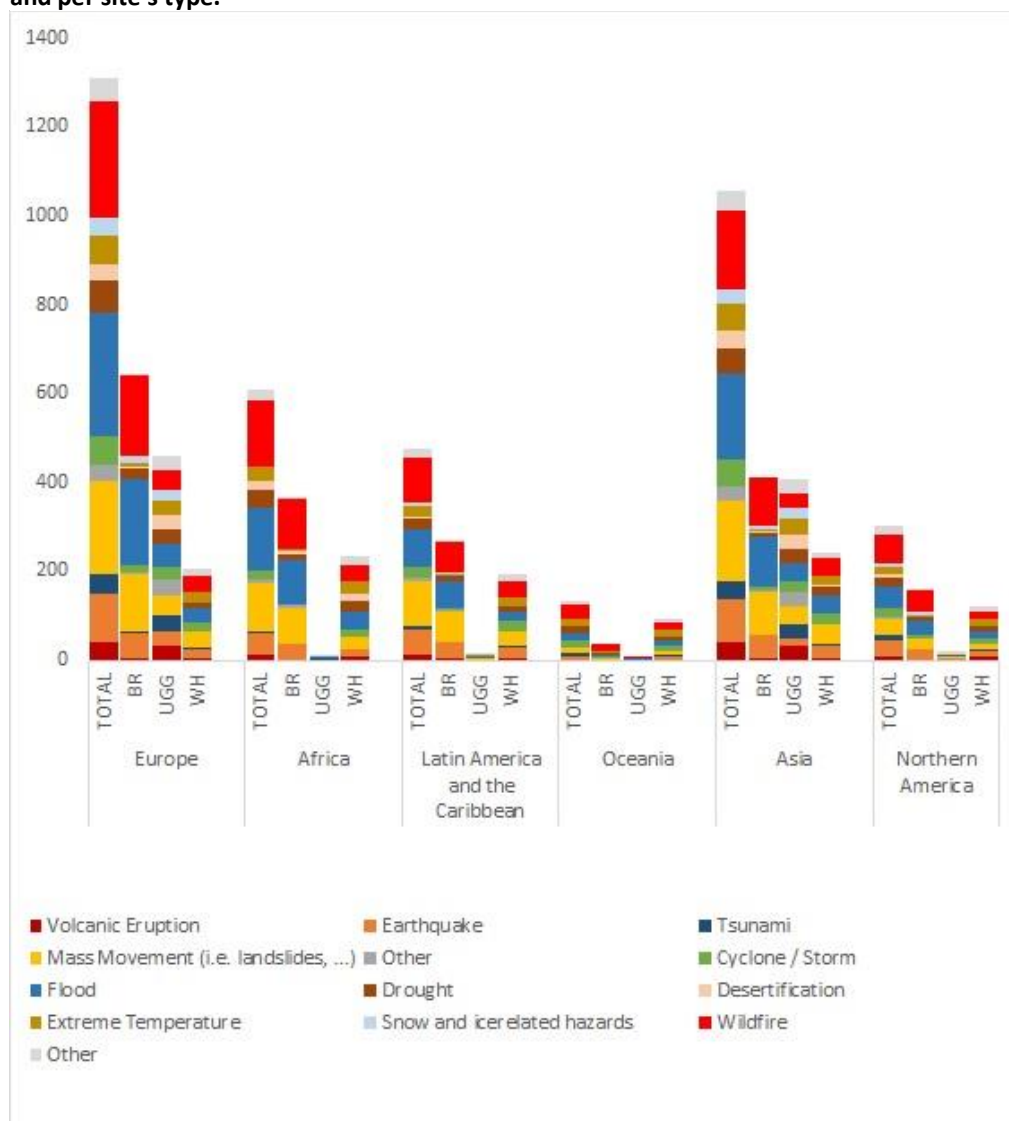
**Figure 1- UNESCO designated sites and sites potentially exposed to at least one natural hazard**



Overall, landslides and earthquakes are the most frequent geohazards (33 % and 18 % of all sites, respectively) while wildfires and floods (41 % and 39 % of all sites, respectively) are the most frequent among hydrometeorological hazards. Such hazards as cyclones, storms, extreme temperature and droughts episodes have a high probability to be triggered at around 10 % of all UNESCO sites. 5% of sites are potentially exposed to volcanic eruptions, tsunamis, desertification issues and snow and ice related hazards. The regional distribution

varies as illustrated on the Figure 2. In Europe and Asia, floods appear to be the most frequent hazard, followed by wildfires in Europe and landslides in Asia. Wildfires are at the top of the hazard list for Africa, Latin and Northern Americas and Oceania; while floods stay the second most frequent hazard in Africa, Oceania and Northern America. Landslides stay on the second position in Latin America and Asia.

**Figure 2 Number of hazards at UNESCO designated sites per type of hazard (Biosphere reserve (BR); UNESCO Global Geopark (UGG); UNESCO World Heritage (WH)), per region and per site's type.**



Additional information on DRR issues were based on the thematic surveys and cover only Biosphere Reserves and UNESCO Global Geoparks. Despite a large number of sites potentially exposed to natural hazards, only 8% of BRs and 30% of UGGs have performed a detailed risk assessment. At least 21% BRs performed various monitoring activities. 24% BRs are interested in assistance in risk assessment.



## **Role of UNESCO designated sites as platforms for education and awareness**

UNESCO-designated sites are often an important source of employment and income, through tourism-based activities and environmental goods and services. UNESCO-designated sites promote sustainable development, and focus on the protection of natural and cultural heritage or the conservation and sustainable use of biodiversity and geological resources. In that context, they are mobilized to address the challenges of DRR and have a great potential to play an important role in the achievement of the Sendai Framework for Disaster Risk Reduction targets but most crucially, to support their communities to better cope in case of a disaster, contributing in raising of awareness and building resilient communities.

The main key to the successful prevention of severe consequences is the people who work at local level. Local governments, NGOs, and especially UNESCO-designated sites site managers and staff, need to be aware of the risks affecting their sites and to undertake all possible mitigation and prevention measures.

Often UNESCO designated sites have an important role in coordination of disaster risk management and cooperation with its relevant local stakeholders, whose responsibilities include DRR related issues. For instance, the Lower Morava Biosphere reserve in Czech Republic, being exposed to several natural hazards such as floods and wind erosion, acts as an information platform and service agency. It contributes to local disaster management by : 1) providing the logistic support for respective surveys, 2) determining locations of potential hazards and reporting to the relevant authorities based on consultations with local communities and stakeholders, 3) helping to disseminate the risk management plans and participating in their revisions, 4) helping the stakeholders to prepare documentation if the risk can be resolved by specific project, locate potential funds, create grant application and supervise the realization, 5) cooperating with universities on related research and educational programs for students.

**Figure 3 – Research on landscape of the Lower Morava Biosphere reserve with its ecosystem services for disaster risk reduction (photo: Petr Cupa)**



UNESCO designated sites are engaged in awareness raising, including educational activities, as well as mitigation strategy development on natural hazards and the need for the sustainable use of natural resources. According to UNESCO surveys addressed to site managers, half of UNESCO Global Geoparks and at least 19 % of Biosphere Reserves participate in different kinds of educational and prevention and mitigation awareness activities.

Education and awareness-raising on disaster prevention among community residents are priorities at many UNESCO designated sites in such disaster prone countries as Indonesia and Japan. The Ciletuh-Palabuhanratu



**Figure 4 - Training at the Ciletuh-Palabuhanratu UNESCO Global Geopark (photo credit: Ciletuh-Palabuhanratu UNESCO Global Geopark)**

UNESCO Global Geopark has a long coastal area that connects directly with the Indian Ocean. The southern part of Java constitutes an ongoing and active subduction zone between the Indian Ocean plate and the Eurasia continental plate, causing frequent earthquakes occasionally accompanied by tsunamis. Moreover, the highlands show vulnerability to landslides and floods due to heavy rainfall, which can disrupt traffic and limit accessibility to the Geopark. Lectures are held by scientists from universities or related government institutions to educate school children and the general public on the mechanisms of tsunamis, earthquakes, landslides and the damage caused by these disasters. Signage warning about danger zones, beach observation posts, evacuation routes and assembly points are also placed in affected areas and locations with a high frequency of visitors.

Situated in an active tectonic belt the Japanese Islands frequently feature geo-hazards such as earthquakes and volcanism. The Toya-Usu UNESCO Global Geopark has experienced several volcanic eruptions in the past centuries and the area is under constant risk of further hazards. Mt. Usu resumed volcanic activity in 1663 and has erupted repeatedly since then, causing severe damage and claiming many casualties. Advised by academics, local municipalities have preserved collapsed buildings and infrastructure, remains of the eruptions, in order to educate locals about the consequences related to the events. Toya-Usu UNESCO Global Geopark also certifies local residents as “Volcano Meister” who have in-depth knowledge of the area and the eruption history of the Usu Volcano and pass on scientifically sound information, records and memories of eruptions and practices for disaster risk reduction. The Toya-Usu Volcano Meister Network is a volunteer based educational association that not only organizes conferences and lectures focused on disaster prevention but also is dedicated to highlighting the charms of the Toya-Usu UNESCO Global Geopark.

**Figure 5 - Trainings are conducted by trained local volunteers “volcano meisters” at the Toya-Usu UNESCO Global Geopark (photo credit: Patrick Mc Keever)**



Aso UNESCO Global Geopark represents another example of DRR public education in Japan. The infrastructure of the Aso Geopark, including the Aso Shrine and Aso Volcano Museum, was heavily damaged after two major earthquakes in 2011 and 2016. To contribute to the local economy and disaster risk education, the Aso Geopark Guide Club initiated educational tours through devastated area to commemorate disaster events; more than thousand visitors were guided in 2017.

Many European UNESCO designated sites cooperate to enhance disaster risk reduction. For instance, two Greek and one French Geoparks - the Psiloritis, the Lesvos and the Haute Provence - undertake activities aiming to raise earthquake awareness and cope with children emotions. During last several years, activities addressed to children aged 5 -13 years resulted in various outcomes like exhibitions, training activities and the creation of several educational and dissemination tools in five languages.

Mexico encompasses several convergent and transformant tectonic plate borders that cause intense seismic and volcanic activities —these demand a prepared society with special regard to resilience. In addition to geohazards, many territories are under risk of severe drought, especially the north of the country, whereas flooding and hurricanes devastate the coastal and southern states. Comarca Minera UNESCO Global Geopark, Hidalgo is under hydrometeorological risk during the rainy season (from June to October), so that intense rain and flood that induce landslides recurrently occur. Therefore, towns and sparse population in mountainous areas become isolated and roads temporarily impassable. Joint efforts between Comarca Minera UNESCO Global Geopark, the Centre of Atmospheric Sciences of the National Autonomous University of Mexico, and the Tourism Secretariat of the Hidalgo State seek to raise awareness on geohazards and hydrometeorological hazards. Among the actions carried out, lectures and participative activities are carried out in rural schools focused on the geopark inhabitants, as well as live streaming talks, which allow to reach a wider audience. Many of the specific actions are developed annually during International Disaster Day.

**Figure 6 Disaster risk reduction actions at the Comarca Minera UNESCO Global Geopark (photo credit: Erika Salgado)**



## **Conclusion**

UNESCO designated sites, including Biosphere Reserves, UNESCO Global Geoparks and World Heritage Sites, are located in various geographical settings and their territories may be partly or entirely exposed to various natural hazards and extreme weather events. Potential harm to these natural sites may, or may have already, also put the livelihoods of local communities at risk.

However, even though there is a clear understanding that many UNESCO designated sites and their communities may be potentially threatened by disasters, analysis of reported thematic surveys reveals that most UNESCO designated sites currently do not have risk assessment and efficient risk management plans, nor do they have sufficient expertise and guidance on how to perform it.

In light of the evidences above, urgent measures to strengthening DRR at UNESCO designated sites is indispensable. The Section on Earth Sciences and Geo-hazards Risk Reduction encourage various researchers, disaster risk management and other relevant stakeholders at national level to assist UNESCO designated sites in developing detailed risk assessment and integration of disaster risk management elements in management plans to safeguard UNESCO designated sites.

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