

Challenges and Opportunities for Disaster Risk Management of Cultural Heritage against Floods

Rohit Jigyasu

Herausforderungen und Chancen des Hochwasser-Risikomanagements für Denkmale

Überschwemmungen verursachen enorme Schäden am kulturellen Erbe. Jüngere Beispiele hierfür sind die Hochwasser von 2011 in Thailand, die die Welterbestätte von Ayutthaya schwer traf, sowie die Überflutungen des Jahres 2010 in Pakistan, die viele Ausgrabungsstätten und traditionelle Siedlungen am Indus in Mitleidenschaft zogen (vgl. den Beitrag von F. Ubaid in dieser Publikation).

Die globale Urbanisierung schreitet in beispiellosem Maße voran. Im Jahr 2007 lebten bereits ebenso viele Menschen in Städten wie auf dem Lande, und die Verstädterung hat sich seither noch beschleunigt. Dieser Prozess, begleitet von Verdichtung, baulich-konstruktiven Mängeln und überlasteter Infrastruktur, führt zu einer gewaltigen Belastung für den Bestand an Denkmalen, insbesondere im innerstädtischen Bereich, und erhöht deren Anfälligkeit gegenüber Hochwassern. Hinzu kommt die durch den Klimawandel verursachte Intensivierung und Häufung von extremen Wetterereignissen, wie Starkregen und Wirbelstürmen. Infolgedessen sind heute viele Denkmale verstärkt von Überschwemmungen bedroht. Auch im Bergland, wo es nun häufiger zu Erdbeben kommt, erhöhen sich die Risiken für den historischen Bestand. Die Sturzfluten, die sich im Juni 2013 im Bundesstaat Uttarakhand in Indien ereigneten, lassen erahnen, welche schlimmen Katastrophen in der Zukunft zu erwarten sind. Sie forderten unzählige Menschenleben, zerstörten die Lebensgrundlagen zahlloser Menschen und richteten auch am kulturellen Erbe immensen Schaden an. Die Ursache war eine unglückliche Kombination von Starkregen, Schneeschmelze, Erosion, Erdbeben und ungeordneter Siedlungsentwicklung in den Flussauen.

Der Klimawandel hat aber auch indirekte Auswirkungen. Zum Beispiel können knapp gewordene Ressourcen, wie Wasser, zu verstärkten Konflikten führen, was wiederum die historischen Stätten Zerstörungen oder Plünderungen aussetzen kann. Siedlungen drohen ganz aufgegeben zu werden, mit allen Konsequenzen für die dort bestehenden Werte. Es gibt jedoch auch zahlreiche Beispiele dafür, wie Gesellschaften, die an Küsten, an Fließgewässern oder auf Inseln leben oder leben, durch Versuch und Irrtum einen Bestand an überliefertem Wissen zum täglichen Umgang mit den Gefahren der Überflutung aufgebaut haben, der mit dem uns geläufigen technokratischen Ansatz nichts gemein hat. Der Aufsatz illustriert dies anhand von Beispielen.

Wenn man sich die komplexen Gefährdungssituationen unseres kulturellen Erbes vor Augen führt, wird deutlich, dass ihnen erfolgreich nur mit integrierten Ansätzen begegnet werden kann, die die vielfältigen Gefährdungsarten genauso berücksichtigen wie die spezifischen Schutzbedürfnisse der betroffenen Objekte, die aber auch die lokalen Erfahrungen und Fähigkeiten der Anwohner einbeziehen. Leider verfügen wir nur für die wenigsten Denkmale und historischen Orte über ausgearbeitete, umfangreiche Katastrophenschutz-Konzeptionen, die Angaben zur Vorsorge, zur Gefahrenabwehr und zur Wiederherstellung nach einem Schadensereignis enthalten. Ein Risikomanagement für Denkmale zum Schutz vor Hochwasser bedarf der engen Koordinierung zwischen Denkmalpflege, Katastrophenschutz, Wasserwirtschaft und Wirtschaftsentwicklung. Daher ist eine der großen Herausforderungen, auch auf der Ebene der täglichen Zusammenarbeit zwischen diesen Bereichen eine reibungslose Kooperation in Zeiten vor, während und nach Flutkatastrophen sicherzustellen. Zu diesem Zweck sind verschiedene Initiativen von Organisationen wie UNESCO, ICCROM, ICOMOS und UNISDR gestartet worden. Der Aufsatz stellt diese Initiativen vor und skizziert, wie sie auf globaler, nationaler und lokaler Ebene wirksam werden sollen.

Floods have caused enormous damage to cultural heritage properties around the world. One example is the Balkan floods in May 2014, which caused enormous damage to many historic towns and villages. Such damage was witnessed previously in Rome (Italy) and Beverley (UK) during floods in December and June 2007 respectively. Similarly floods in Pakistan in August 2010 caused damage to many traditional settlements and archaeological sites along the River Indus (see paper by F. Ubaid in this publication). Other noteworthy cases include severe damage to the Ayutthaya World Heritage site due to floods that hit Thailand in 2011 and damage to historic colonial quarters due to Hurricane Sandy that hit New York on 12 October 2012.

Climate Change Impacts on Cultural Heritage

Climate change is increasing the number of disasters and their devastating impacts on cultural heritage. From 1988 to

2007, 76 per cent of all disaster events were hydrological, meteorological or climatological in nature. These accounted for 45% of the deaths and 79% of the economic losses caused by natural hazards (ISDR 2008). The likelihood of increased weather extremes in future therefore gives great concern that the number or scale of weather-related disasters will also increase with profound implications on floods (Fig. 1).

Projected precipitation and temperature changes imply possible changes in floods, although overall there is low confidence in projections of changes in fluvial floods. There is also high confidence that changes in heat waves, glacial retreat, and/or permafrost degradation will affect high-mountain phenomena such as slope instabilities, mass movements, and glacial lake outburst floods. There is also high confidence that changes in heavy precipitation will affect landslides in some regions. The small land area and often low elevation of small island states make them particularly vulnerable to rising sea levels and impacts such as inundation, shoreline change, and saltwater intrusion into underground aquifers (IPCC 2012).

Climate change impacts on cultural heritage are illustrated by several incidents such as flash floods in Uttarakhand in India in June 2013, as a result of which many temples and other historic structures along the river were severely damaged. The cloudburst in Leh, India in August 2010 suffered from flash floods due to unprecedented heavy rains which caused destruction of vernacular adobe heritage. As mentioned before, the storms in Western Europe in 2007 flooded many historic town centres such as Rome (Italy) and Beverley (UK). Undoubtedly, climate change is increasing the number of disasters and their impacts on cultural heritage.

As a result, the nature of disasters is becoming more and more complex due to simultaneous interaction of multiple hazards. For example, Uttarakhand flash floods were caused by or resulted in developments along river banks, soil erosion, landslides, and settlement of foundations, structural cracks, and most importantly climate change impacts that are resulting in a higher intensity of rainfall in considerably shorter time.

Various scenarios caused by climate change may have their impact on cultural heritage located in the regions (IPCC 2012). Due to increased incidents of drought in some areas, water scarcity may turn out to be the main cause of conflict in the future. This would make certain heritage sites vulnerable to exploitation and looting. Heavier rainfall with increased incidents of flooding and associated landslides may impact heritage sites, especially those that are located on mountain slopes. Heritage sites in extremely dry areas may be at risk due to forest fires caused by higher temperatures. Coastal heritage properties in low-lying countries such as Bangladesh may get submerged in the sea due to sea-level rise. Some of the living sites may eventually get abandoned, thereby affecting intangible heritage in these areas.

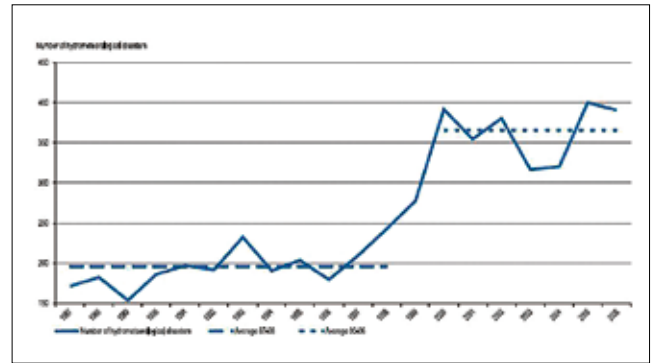


Fig. 1: Occurrence of hydro-meteorological hazards from 1987 to 2006

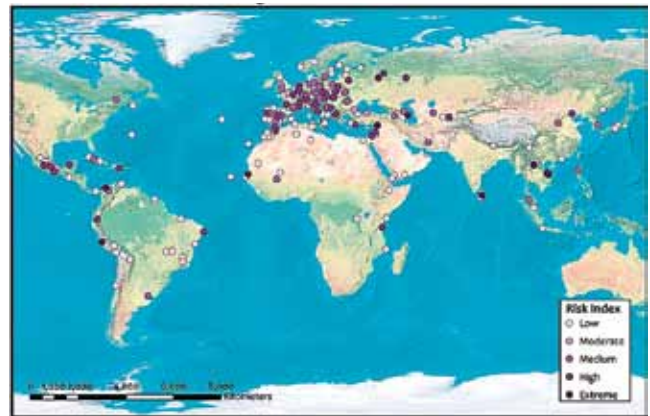


Fig. 2: Flood risk to World Heritage cities

The potential impacts of climate change-related disaster risks on cultural heritage would depend on the type of cultural heritage (archaeological, architectural, cultural landscape, objects, etc) and on the specific attributes of heritage that might be impacted (e. g. tangible, intangible, social, livelihoods, etc). Physical impacts on buildings might be related to their construction system or the nature of material. The location of cultural heritage or its specific component would play a crucial role in its exposure to hazards. The nature and degree of exposure is linked to the question which attribute of the heritage is exposed, to what extent it is exposed, and how frequently. The enclosed map of the World Heritage Cities prepared by the World Bank shows that many of them, especially those along the rivers and coasts, are at increased threat of floods (Fig. 2).

It is important to mention that disasters, including those caused by floods, pose risks not only to the physical attributes carrying the heritage values of the property, but also to the viability of their traditional uses and management systems. Moreover, consideration should of course be given to the danger to the lives of visitors, staff and local communities at the site or in neighbouring areas; also to important collections and documents associated with the property. Finally, risk assessments should consider the impact of disasters on the economic and social development of the affected population, in regard to jobs and income from activities based on



Fig. 3: Ayutthaya World Heritage site, where many canals have fallen into disuse, thereby restricting the water drainage capacity in the event of heavy rainfall

the heritage resource, as well as to identity, social cohesion and the ability to access and observe cultural usages.

Factors Increasing the Vulnerability of Cultural Heritage to Floods

Dynamic vulnerability factors such as urbanisation, poverty and environmental degradation are compounding the risks to lives, properties and the economy. In fact, urbanisation is one of the key factors that is increasing the vulnerability and risks to people, properties and economy. The world is experiencing rapid population growth in the cities. The number of people living in cities equalled those in villages in 2007 and has been rising ever since. In fact, it is projected that in comparison to 2007 by 2025 1.29 billion people more will be living in our cities, and 48 cities in the world have reached a density level of more than 15,000 inhabitants per sq. km. Interestingly, all of them are in the developing countries (OERS and BANDARIN 2014). Dhaka is the most densely populated city with 40,100 persons per sq. km.

Since cities concentrate people, properties, infrastructure and capital stock, the impact of climate change-related hazards can be catastrophic, as shown by floods in Mumbai (2005), Thailand (2011) and Pakistan (2010).

Risks to cultural heritage may stem from exposure to one or more hazards and other determinants. This also implies that we need to understand the inherent link of physical vulnerability of both movable and immovable cultural heritage

to that resulting from social, economic and ‘development’ processes.¹ For example, in the case of risks to museum collections, the vulnerability of the collections is inherently linked to the building in which they are housed and also to the social, political and economic context in which they are located. Therefore, addressing risks to cultural heritage requires much deeper thinking both with regard to the underlying vulnerability factors that put cultural heritage at risk and also to their long-term implications.

It is important to mention here that risks to cultural heritage are not only limited to monuments, but also extend to urban areas where these monuments are located historically or where they were engulfed by urbanisation.² In fact, these historic areas have not received the attention or support they deserve to maintain their vitality and quality, protect their structural integrity and heritage values, and stimulate their local economic base, as their populations, occupancy and economies undergo various incremental processes of transformation as a result of which the traditional urban boundaries are breaking up, disturbing delicate ecological relationships and exposing these areas to increasing risks from external hazards. The cases of Gyantse in Tibet, China and Bangalore, India illustrate this issue very well. Moreover, local communities are losing control over their own resources as traditional management systems are being eroded and increasingly replaced by alien systems, which in many cases prove to be ineffective in reducing risks to local communities inhabiting these areas. Another consequence of these factors is the gradual disappearance of traditional

skills, crafts and cultural practices, putting living aspects of heritage at risk.³

Contribution of Heritage to Resilience

However, heritage – both tangible and intangible – is not just a passive resource liable to be affected and damaged by disasters. Rather it has a proactive role to play in building the resilience of communities and saving lives and properties from disasters. Countless examples illustrate this point. Traditional knowledge systems embedded in cultural heritage, which evolved over time through successive trials and errors, can play a significant role in disaster prevention and mitigation, thereby contributing to more sustainable development. Such local knowledge often equips communities to face natural hazards better through their lifestyles, customs and traditional livelihoods. For example, several traditional constructions in Gujarat, Kashmir and Haiti have resisted earthquakes very well, whereas many contemporary structures collapsed like a pack of cards. Certain coastal communities over the centuries have not only become capable of foreseeing natural hazards such as floods and cyclones, but are also better equipped to deal with them through such measures as building on stilts and erecting wind-resistant structures. Traditional systems for flood mitigation are also seen in the way intricate canal systems and water gates were designed in historic cities like Ayutthaya to drain off excess water during heavy rainfall (Fig. 3). Unfortunately, the covering-up of many of these canals along with rapid urbanisation destroying the ecosystem of the region, coupled with climate variability factors have increased the vulnerability of the city over time. The ‘living with risk’ approach is also seen in island communities that are frequently faced with the vagaries of floods. Take the case of Majuli Island in the river Brahmaputra, where communities have employed traditional methods of island protection using bamboos rather than constructing permanent embankments (see paper by D. Jauhari in this publication). The clayey soil retained through these measures is used by the local community for making pottery, thus providing them with a sustainable source of livelihood. Moreover, traditional planning of houses on stilts and bridges made of bamboo allow the discharge of water during heavy rains. In addition, these structures can be easily moved depending on the changing topography of land during each monsoon season. Such adaptive coping mechanisms have allowed island communities to live with floods rather than to fight against them (Fig. 4).

In fact, when traditional skills and practices are kept alive and dynamic, they can contribute to the rebuilding of resilient communities after disasters. Local masons and craft workers can rebuild shelters using local knowledge and resources, salvage and reuse materials from collapsed structures, help the community to reduce dependency on external support and provide livelihood sources crucial for sustain-



Fig. 4: Majuli Island, India: vernacular architecture built of bamboo on stilts, designed in response to floods that are regular phenomena in the region

able recovery. In this sense, cultural heritage optimises locally available resources and the socio-cultural needs of communities.

Cultural heritage sites have also served as refuge areas during disasters, for example temples located on higher ground were used as refuge during the Great East Japan disaster in 2011. If properly maintained, traditional water systems also provide supplies during emergency situations when electricity cannot be relied on, as exemplified by the *hitis* (water tanks) in Nepal’s Kathmandu Valley.

Last but not least, the symbolism inherent to heritage is also a powerful means of communicating risks and helping victims to recover from the psychological impact of disasters. Traditional social networks that provide mutual support and access to collective assets are extremely effective coping mechanisms for community members.

Current Level of Preparedness

While many efforts are under way to reduce the vulnerability of heritage to disasters, a 2006 report prepared by the World Heritage Centre at the request of the World Heritage Committee stated that “most World Heritage properties, particularly in developing areas of the world, do not have established policies, plans and processes for managing risks associated with potential disasters”.⁴

Recent research of the World Heritage Centre on geological risks, based on open-access risk data, has revealed that 76% of all World Heritage properties are potentially exposed to at least one of five main geological natural hazards (earthquake, tsunami, landslide, volcanic eruption or severe erosion). At the same time, the data contained in two reporting systems within the World Heritage Convention have been analysed to estimate the level of awareness

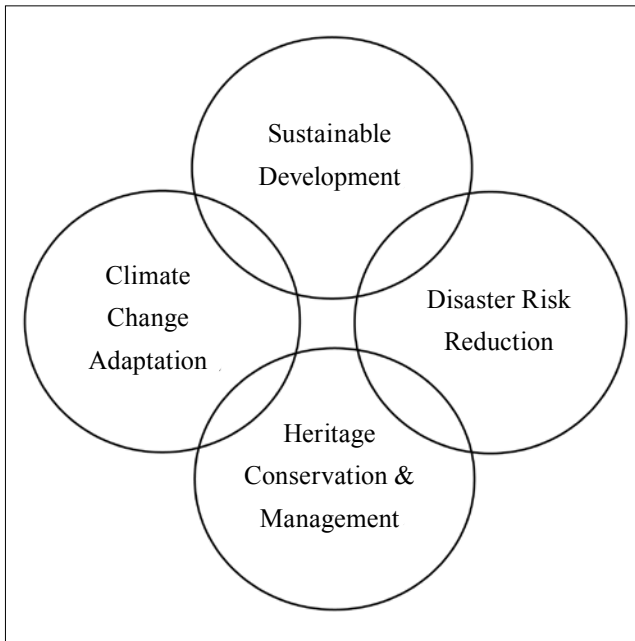


Fig. 5: Interrelationship between CCA, DRR, sustainable development, heritage conservation and management

of risks and the preparedness to deal with them, relating to geological hazards at World Heritage properties. According to these reports, 51% of the site managers indicated that their sites were exposed to at least one geological hazard (UNESCO 2015).

Another research project surveyed 60 World Heritage properties and identified 41 properties over 18 countries as most at risk from natural and human-induced hazards, according to the World Risk Index.⁵ Information held within UNESCO archives on the management systems established for these World Heritage properties was then examined in order to determine the extent to which the relevant disaster risks are identified and addressed.

Need for Mainstreaming Cultural Heritage Concerns in Disaster Risk Reduction and Climate Change Adaptation

Effective risk reduction for cultural heritage would therefore necessitate a synergy between agendas for development, disaster risk reduction, climate change adaptation and heritage conservation and management (Fig. 5).

This would require developing linkages between policies, institutional and management systems for cultural heritage with those at wider territorial levels. On the one hand, a disaster risk management plan should be integrated into site management systems; on the other hand, these site management systems should be connected to disaster risk management and climate monitoring systems at urban, district or regional levels.

This would imply that regional/national level agendas/policies should be linked to local systems and processes and vice-versa (top down and bottom up). Right now there is a big gap between these levels. Moreover, considering high uncertainties and longitudinal time dimension involved in assessing impacts of climate change on cultural heritage in general and archaeological sites in particular, it is important to identify practical measures/procedural changes that can be put in place for conservation and management at site level to reduce risks foreseen as a result of climate change or to adapt to them.

In order to achieve this, a fundamental shift in conservation, from a reactive to a more proactive approach, is necessary, aimed at addressing the change rather than mere static preservation in the 'original' state defined by a particular time period. Also rather than seeing climate change adaptation and disaster risk reduction as two parallel activities, climate change impacts should be factored in disaster risk assessment and mitigation practices.

The predominant perception among professionals as well as among the local communities is that cultural heritage is limited only to a select group of monuments or objects and in that sense is elitist. Therefore, concerns for cultural heritage in disaster management are seen as secondary, with the understandable logic that the concern for saving lives and livelihoods should take precedence over the preservation of cultural heritage.

As mentioned before, the scope of cultural heritage has extended way beyond select monuments, groups of buildings or objects to include vernacular houses, historic urban areas, cultural landscapes, and even intangible dimensions of living heritage such as skills and cultural practices. This expanded scope of heritage needs to be integrated within various development sectors through redefining and repackaging heritage concerns by measures such as regenerating traditional livelihoods and ecological planning.

Global Initiatives

To address these challenges at global level, several initiatives have recently been taken by various international organisations such as UNESCO, the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), the International Council on Monuments and Sites (ICOMOS) and the United Nations Office for Disaster Risk Reduction (UNISDR). A strategy for risk reduction at World Heritage properties was presented and approved by the World Heritage Committee at its 31st session in 2007. The strategy identifies five objectives and related actions that are ordered around the five priorities for action defined by the Hyogo Framework for Action 2005–2015, the main UN policy on disaster risk reduction:

- Strengthening support within relevant global, national, regional, and local initiatives for reducing risks at World Heritage properties.
- Using knowledge, innovation and education to build a culture of disaster prevention at World Heritage properties.
- Identifying, assessing and monitoring disaster risks at World Heritage properties.
- Reducing underlying risk factors at World Heritage properties.
- Strengthening disaster preparedness at World Heritage properties for effective response at all levels.

There are many instances where cultural heritage has contributed towards building the resilience of communities, particularly in response to and for the recovery from disasters. The cultural dimension in general and heritage in particular play an important role in the sustainable recovery and rehabilitation of communities following a disaster.

Encouraged by such examples, the development of the World Heritage Resource Manual on *Managing Disaster Risks for World Heritage*, jointly published by UNESCO, ICCROM, ICOMOS and IUCN in 2010, is a landmark achievement.⁶ This manual provides for the first time a stepped guidance for site managers to develop disaster risk management plans as part of an overall site management system.

Another heritage and resilience initiative was launched by the ICOMOS International Committee on Risk Preparedness (ICOMOS-ICORP) in collaboration with UNESCO, ICCROM and UNISDR at the Global Platform on Disaster Risk Reduction held in Geneva in May 2013. A special publication showcasing various case studies that highlighted the role of cultural heritage in building the resilience of communities against disasters was also unveiled on this occasion.⁷

In matters of capacity-building, a pioneering initiative has been undertaken by the UNESCO Chair established within the Institute of Disaster Mitigation for Urban Cultural Heritage at Ritsumeikan University, Kyoto (Japan), which in cooperation with ICCROM, ICOMOS-ICORP and the World Heritage Centre has organised an international training course on disaster risk management of cultural heritage since 2006. The target groups for this course include government institutions, departments, universities, NGOs and private consultants from the cultural heritage field, as well as relevant disaster management fields. Based on the experience gained by conducting this course, a training guide has recently been published to help other interested organisations set up similar training programmes elsewhere in the world.⁸ UNESCO and ICCROM, in cooperation with various organisations, have spearheaded several other capacity-building activities in this area at international, regional and national levels. These include training courses organised in Rome, Albania, Romania, Mexico, India, Indonesia, Viet Nam, Myanmar, Egypt, Bulgaria and proposed in Romania and Malta scheduled later this year. Several World Herit-

age sites, such as the Complex of Hué Monuments, Hoi An Ancient Town, the Imperial Citadel of Thang Long in Hanoi (Viet Nam) and the Historic City of Ayutthaya (Thailand), have also formulated disaster risk management plans and are in the process of implementing them (UNESCO 2015).

It is also crucial to organise emergency response simulations or drills to ensure that staff at the site and external response agencies are able to develop and regularly practise standard operating procedures. Japan has taken a lead in this, holding a National Disaster Reduction Day every 26th of January to commemorate a fire incident that destroyed the historic Horyu-ji temple in 1949. Recently one such simulation exercise was conducted for the first time in India at the World Heritage astronomical observation site of Jantar Mantar, Jaipur (ibid).

Past experience shows that cultural heritage is often destroyed due to the uninformed actions of national and international rescue and relief agencies, who lack a proper methodology for damage assessment that takes into consideration both safety and heritage values. Often standard principles for contemporary ‘engineered’ buildings are applied to historic and traditional ‘non-engineered’ buildings with the result that many of them are categorised as unsafe and therefore as ready for demolition. To address this challenge, culture – and heritage – has recently been included as a stand-alone sector in the so-called Post-Disaster Needs Assessment (PDNA).⁹ This is a government-led exercise, with integrated support from the United Nations, the European Commission, the World Bank and other national and international actors, which takes place after major disasters. It will enable the inclusion of heritage in the identification of recovery needs and appeals for funding, as well as the integration of concern for heritage within the recovery and reconstruction strategies of other sectors.

ICORP has been working extensively towards promoting the protection of cultural heritage from the effects of disasters and armed conflict by being actively involved in organising symposiums and preparing guidelines, exhibitions and capacity-building programmes.

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Fig. 1: UNEP 2004, State of the Environment and Policy Perspective. Available at http://www.unep.org/geo/GEO3/english/pdfs/chapter2-9_disasters.pdf . Accessed on 7 September 2015

Fig. 2: Bigio, Ochoa and Amirtahmasebi, 2014, Climate-resilient, Climate-friendly World Heritage Cities, , Urban Development Series Knowledge Paper, World Bank Group, p. 6. Available at <https://openknowledge.worldbank.org/bitstream/handle/10986/19288/896350WP0UDS0190WHC0Box0385289B00PUBLIC0.pdf?sequence=1> Accessed on 7 September 2015

Figs. 3–5: Author

- ¹ The social, economic and developmental processes are slow and progressive but contribute significantly towards making cultural heritage weak and vulnerable to potential momentary hazards. These include fast transformation processes resulting from the increasing population, urbanization and development pressures, from poverty and, not to forget, from human vandalism and carelessness.
- ² These historic urban areas are still ignored cultural resources defined through their distinct morphology, urban fabric, architecture, community structure and boundaries.

They have carefully evolved through the local communities' sensitive understanding of their environment with which they have co-existed harmoniously and have sustained the built environment and various interrelationships over generations.

- ³ In fact many of these living aspects of cultural heritage have effectively contributed towards mitigating the impact of disasters, and also coping with and recovering from them.
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- ⁶ <http://whc.unesco.org/uploads/activities/documents/activity-630-1.pdf>
- ⁷ <http://icorp.icomos.org/index.php/news/44-new-icorp-publication-heritage-and-resilience>
- ⁸ R. Jigyasu and V. Arora, 2013, Disaster Risk Management of Cultural Heritage in Urban Areas: A Training Guide, Research Center for Disaster Mitigation of Urban Cultural Heritage, Ritsumeikan University, Kyoto, Japan.
- ⁹ <http://www.recoveryplatform.org/pdna/>