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ANALYSIS OF CASE STUDIES IN
RECOVERY AND RECONSTRUCTION

CASE STUDIES

2020

Patan, Nepal • Taishun, China • Nyanza, Rwanda
Aleppo, Syria • San Pedro de Alcántara, O'Higgins Region, Chile
WH Cultural Landscape Wachau, Austria • San Luis Potosí, México

VOL. 2

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Foreword

ICCROM and ICOMOS have closely worked together for the protection of cultural heritage, especially in the field of the World Heritage. We are pleased that the case studies project for reconstruction and recovery of cultural heritage added a new dimension to the relationship of the two organisations. The secretariats as well as the experts selected by the two institutions met physically and virtually on regular basis over a period of two years to have this work produced and contribute to knowledge in this field.

We discussed every aspect of the project, from the text of every case study included in the two volumes to our joint letters, until we agreed on all required steps together. This collection of case studies is an outcome of such fruitful collaboration between the two organisations. We are convinced that each case study report, which was carefully and rigorously peer reviewed by a team experts, will stimulate and promote further research and analysis. We look forward to the resonances of this joint work.

Last but not least, we express our sincere gratitude to all colleagues who worked in this project, including the ICCROM-ICOMOS experts and researchers who worked on this volume, for their wonderful contributions. We do hope that other similar joint projects will further be developed by the two organisations in the near future.

For ICOMOS,
Toshiyuki Kono, *Honorary President*
Marie-Laure Lavenir, *Director General*

For ICCROM,
Webber Ndoro, *Director General*
Zaki Aslan, *ICCROM-Sharjah Director*

Introduction

Analysis of Case Studies in Recovery and Reconstruction

The scale, intensity and frequency of catastrophic events affecting cultural property have been a subject of international concern. Efforts at recovery and reconstruction of damaged communities and environments have increasingly attracted attention, from the perspective of supporting peoples impacted by such events while attempting to maintain the cultural significance of places. This project arose from the decision of the World Heritage Committee of 24 June 2018, directing the attention of advisory bodies towards the examination of case studies. The need to learn from the experiences captured through case studies had been apparent for some time.

Separately, ICCROM and ICOMOS have addressed the issues involved in post trauma recovery and reconstruction in the context of cultural heritage. The Project, **Analysis of Case Studies in Recovery and Reconstruction**, was a joint endeavour that sought to bring the knowledge and capacities of both bodies to bear, in order to enhance understanding of experience with the aim of clarifying issues and improving guidance. The Project was launched in 2019 for completion in 2020. It was managed through a joint Working Group comprising members of both organisations and administered through the ICOMOS Secretariat in Paris and the office of ICCROM Sharjah.

The Project commissioned a range of case studies that represented a comprehensive set of factors, namely geographical, cultural and causational, utilising the *ICOMOS Matrix for the Compilation of Case Studies* to provide a common structuring framework for compilation and analysis. Eleven case studies were analysed, covering sixteen significant sites and buildings. The project was able to draw from the case studies lessons that have wider application, and its findings are published online in **ICOMOS-ICCROM Project. Analysis of Case Studies of Recovery and Reconstruction. Report**

The case studies that were the subject of analysis are published in two volumes.

Case Studies Volume 1.
Mostar, Bosnia and Herzegovina
Nablus, Palestine
L'Aquila, Italy
Christchurch, New Zealand

Case Studies Volume 2.
Patan, Nepal
Taishun, China
Nyanza, Rwanda
Aleppo, Syria
San Pedro de Alcántara, O'Higgins Region, Chile
WH Cultural Landscape Wachau, Austria
San Luis Potosí, México

ICOMOS-ICCROM: Analysis of Case Studies of Recovery and Reconstruction

ICOMOS-ICCROM Analysis of Case Studies in Recovery and Reconstruction: Working Group
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With the support of Maureen Thibault, Alyssa Rose Gregory, Ahmed Suleiman.

Editorial group
Loughlin Kealy, Luisa de Marco, Amra Hadzimuhamedovic, Trevor Marchand, Alyssa Rose Gregory, supported by Angelique Ploteau.

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POST-EARTHQUAKE RECOVERY AND CONSERVATION-RESTORATION IN PATAN, NEPAL

Martina Haselberger, Rohit Ranjitkar, Gabriela Krist

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1.1 Description, Designation and Recognition

1.1.1. General Description

Patan Durbar Square with its temples and the Royal Palace is the functioning core as well as the urban and cultural centre of the former royal city of Patan (Lalitpur) and since 1979 it has been inscribed on the UNESCO World Heritage List as part of the Kathmandu World Heritage Property (fig. 1, Map 1). Embedded in the Kathmandu Valley in the midlands of Nepal, directly at the trans-Himalayan trade route between India and Tibet, it boasts a rich tangible and intangible cultural heritage.

On an area of approximately 160 x 70 metres, the site comprises a cluster of around fifteen larger and a range of smaller monuments (Korn 1976). The building typologies range from tiered and shikhara-style temples, free-standing pillars, stupa and mandapa to water-wells. The Royal Palace facing the square includes major temples (Degutale, Taleju and Agam Temple) and three main courtyards (Mul Chowk, Sundari Chowk, Keshav Narayan Chowk) housing precious artworks and the Patan Museum, which ranks among South Asia's finest art museums (figg. 2-4). The architectural elements are of great artistic significance and their ornamentation and decorations display the high level of craftsmanship of the local Newars in brick, stone, timber and bronze. The overall harmonious co-existence of Hindu and Buddhist buildings is considered unique (Pruscha 2015: 30).

The square was and, regardless of the catastrophic earthquake in 2015, still is an important public space for urban life that takes place here. It is a place for social interaction, exchange of goods and labour and acquiring income (market stands, souvenirs shops, etc.) as well as major tourist hotspots. Its monuments are background nuclei and an integral part of daily offerings, rituals, worship and commemoration as well as countless local traditions and seasonal festivities.

▸

From left to right:
Fig. 1. Aerial view of the Patan Durbar Square (Kathmandu Valley Preservation Trust)
Map. 1. Site plan depicting the numerous monuments on the Durbar Square (left) and the Royal Palace with its courtyards and the adjacent garden (right) (Kathmandu Valley Preservation Trust)
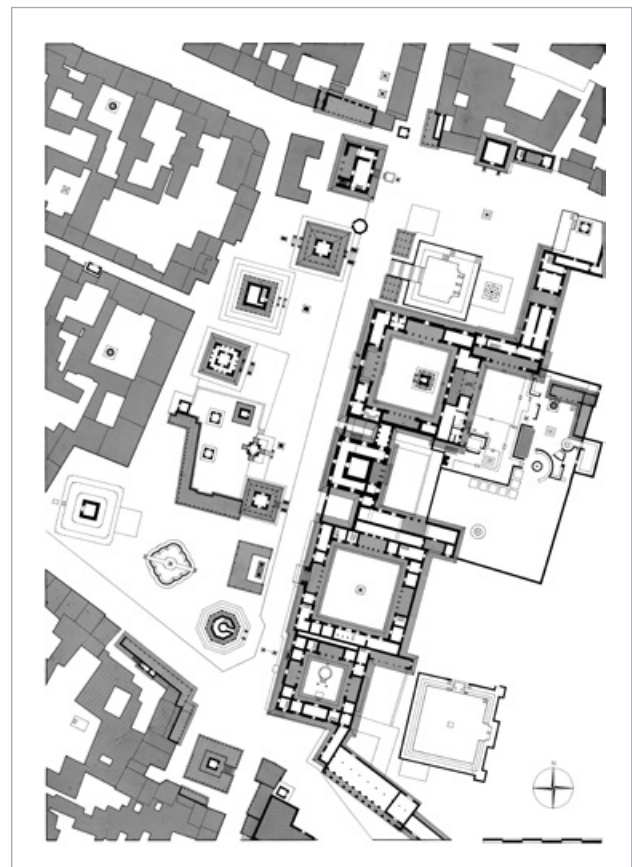
◄
From top to bottom:
Fig. 2. Patan Durbar Square before the earhtquake 2015 (Kathmandu Valley Preservation Trust, 2008, photo by Stanislaw Klimek)
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Fig. 4. View at the Durbar Square with the Royal Palace on the right-hand side in 2017 (Institute of Conservation, University of Applied Arts Vienna, 2017, photo by Christoph Schleßmann)

Cultural and daily life thus revolve around the monuments and the living culture is closely associated with the tangible cultural heritage, which make Patan a living heritage site. The intensity of activity and interchange is not only due to the high concentration of important monuments in the square but also due to its location at literally the crossroads of the city – in many cases the shortest and most conventient path leads through Durbar Square (Sekler 1979: 104).

1.1.2. Form, Function, Creation and Subsequent Transformations

Among the three durbar squares in the Kathmandu Valley, the one in Patan can be considered best preserved with regard to its original form, layout and design (Korn 1976: 80).

It shows a rectangular layout, whereby the temples and smaller monuments are arranged opposite the around 100 m long west façade of the Royal Palace on the brick-paved square. Either their entrance or their main doors face the palace. In the eastward direction, behind the palace, the garden extends approximately 200 m, and houses the Bhandarkhal tank water reservoir. The monument zone is enclosed by adjacent dwellings and traditional houses.

Brick, tile, wood and stone are the prevailing materials of the monuments. Bricks are made from different clays and available in different shapes (e.g. common, trapezoidal cut) or with ornaments in relief (Bonapace, Sestini 2003). The most common wood species used for the construction of the monuments is *Sal*, a high quality and very strong and durable wood (Bonapace, Sestini 2003). With regard to stone, two varieties have been used in the context of built cultural heritage in Patan: a fine-grained sandstone (Fuchs 2013; Leiner 2010), for stone walls, multi-piece sculptures and finely carved reliefs, and a metamorphic stone variety, a kind of schist (Kaipf 2017), for load-bearing structural components, free-standing pillar shafts and monolithic sculptures.

The buildings and monuments comprising the site vary in size and style, whereby the prevailing building type are tiered temples, so-called *mandir* (Nepalese) or *dega* (Newar).[1] for which the Kathmandu World Heritage Property is well-known (fig. 5). Erected on stepped brick plinths, these often multi-tiered temples are mostly built of fired bricks with mud mortar and structural elements made of timber. Their projecting roofs are covered with small overlapping terracotta tiles and capped with fire-gilded pinnacles. The wooden posts, windows, doorways and struts have rich decorative carvings.

The other existing temple typology is the Shikhara-style temple, a Nepalese adaption of the Indian stone temples, of which three are located on the square (Korn 1976: 80; Bonapace, Sestini 2003: 9). Two of them are built of small stone blocks pointed with mortars (fig. 6), whereby varying mixtures were applied in the framework of previous restoration and repair work. The remaining one is built of brick. Lime plaster was later added to prevent biological growth.

▶
From left to right:
Fig. 5. Example of a tiered temple: Harishankara Temple at the Patan Durbar Square before the earthquake 2015 (Institute of Conservation, University of Applied Arts Vienna, 2017, photo by Christoph Schleßmann)
Fig. 6. Example of a Shikhara-style temple: Krishna Mandir at Patan Durbar Square before the earthquake 2015 (Kathmandu Valley Preservation Trust, 2008, photo by Stanislaw Klimek)

Beside the temples, two mandapa (public resthouses) mark the entrance to the Hiti, a traditional public water supply system, at the northern end of the square. They rank among vernacular style buildings again made of brick with mud mortar, timber structural elements and tiled roofs. Despite their comparatively small dimensions, they make a significant contribution to the setting (Jing, Forbes, Wijesuriya 2016) and are considered a common meeting place and rest area.

The Royal Palace, the largest structure within the urban ensemble, comprises multiple interlinked multi-storeyed buildings and temples arranged around three courtyards. (figg. 7-8) Similar to the tiered temples, the palace is made of brick masonry in a structural wooden frame adorned with highly decorated timber windows, doors, roof struts and cornices.

Studies on these building typologies and the Nepalese architecture in general were compiled by German architect Wolgang Korn and published in a comprehensive series (Korn 1976, 2014, 2015). Historical construction assemblies, materials and tools were further adressed in research and studies by Gutschow, Kölver and Shresthacarya (1987), Le Port (1981), Bernier (1977), Teophile and Ranjitkar (1992), Bonapace and Sestini (2003) and, since 2010, in the framework of conservation scientific research by the Institute of Conservation at the University of Applied Arts (IoC).

◀
From top to bottom:
Fig. 7. View at the Pillar of Yoganarendra Malla (left) and the Royal Palace (right) before the earthquake 2015 (Institute of Conservation, University of Applied Arts Vienna, 2013)
Fig. 8. Patan Royal Palace Complex, existing west elevation (Kathmandu Valley Preservation Trust)

The creators and builders of these monuments have been inhabitants from the Kathmandu Valley, particularly from the ethnic group of Newars, who are renowned for their craftsmanship and artistry particularly in wood, metal and stone. Many of the craft skills still exist today as they have been handed down from generation to generation and are available in the term of practitioners from Bhaktapur and Patan. A number of them, explicitly master carpenters, wood carvers and masons from Bhaktapur, as well as stone carvers and metal workers from Patan, have been engaged in rebuilding and reconstruction work after the 2015 earthquakes (KVPT 2016: 13). What has partly changed over the centuries are the tools used, methods of processing and the way craftsmen work. For example, the practice of planking and nailing is an only recently used technology. Traditionally, laths were just laid over the rafters without nailing. Another traditional method was made like roof tiles, which is referred to as *chilaapa* in Newari (Gutschow, Kölver, Shresthacarya 1987:156–157). Planking and nailing as it is practiced today, was only introduced in the 1970s, when waterproofing membranes were introduced on the roofs, which needed a plain surface.

The majority of the monuments, shaping today's cityscape, can be dated from the middle of the sixteenth to the mid-eighteenth-century, during the reign of the Malla Dynasty (c.1201-1769).[2] A century earlier, in the middle of the fifteenth-century, the Nepali empire was divided into the three kingdoms of Kantipur, Lalitpur and Bhaktapur. In terms of cultural heritage, the subsequent constant rivalry and competitive behaviour between the three rulers led to a golden period of art and vigorous building activities, also resulting in the erection and expansion of the monuments in Patan.

Furthermore, the Royal Palace took its present form in the seventeenth-century, while its previous building dates back to the twelfth-century and had been constantly adapted and extended (Korn 1976: 82). Courtyards were either designated to be the palace of the royal family (as was the case with the Sundari Chowk) or intended to house sancutaries and provide space for dances and ceremonies (e.g. Mul Chowk).

Most of the temples on the square were erected by the kings in memory of their relatives or as offerings to certain deities or tutelary gods and godesses (Korn 1976: 80). These monuments are still widely used by the local residents in the context of rituals and festive occasions, in the the same way their forefathers used to do (Ranjitkar 2018: 22).

With the establishment of Kathmandu as the capital of Nepal in 1769 and the move of the monarch, the Royal Palace in Patan lost its function. On one hand, this abandonment spared the palace from extensive modifications and expansion of its layout, as was the case in Kathmandu, which served another 200 years as the seat of the royals and/or government (Korn 1976: 89). On the other hand, it resulted in neglect and lack of maintenance and care. Over a period until 1993, the palace housed various administrative and governmental offices, amongst others a police station (Korn 1976: 73). This new use required adaptions mainly in the interior layout, for example whitewash was applied frequently on the interior walls and covered important wall paintings (Gutschow, Roka 2017; KVPT 2016: 12).

Throughout history, the structures were subject to transformation due to repairs, demolition and reconstruction following earthquakes. In particular cases it is known that affected temples and houses were rebuilt using a simplified or completely different design (Ranjitkar 2018: 25). For instance, the Baidegah Temple on Patan Durbar Square, an originally tiered temple that was damaged in the 1934 earthquake, was replaced with a domed temple in the aftermath. In this case, the transformation had some positive impact on the seismic response. The downsizing of the monument and the waiving of the roof overhangs causing heavy load and the timber column arcade on the ground floor, both features of the preceding tiered temple, improved seismic resistance. Negative impacts of the transformations of monuments are the loss of traditional configurations, architectural form and technologies together with traditionally applied skills. Fortunately, the intangible heritage is usually not affected by these transformations as the building type is not relevant for devotees.

Another important aspect is the living culture and traditions in Nepal that constantly shaped the appearance of monuments and historic structures.

New layers, decorations or embellishments were added as votive offerings. These are prevalent concepts in Buddhism and Hinduism to earn good karma or to remind posterity of one's deed. Such *offerings* include marble tiles, shiny metal roofs, canopies, railings, iron grids or new lighting system, interventions that are often detrimental to the historic fabric (Ranjitkar 2018: 22; KVPT 2016: 40–41). With the opening of the country to the outside world in the 1950s, foreign influences grew and imported new ideas as well as materials. These materials were added to the monuments both as part of votive offerings and of construction measures. In particular, cement was introduced mainly in the course of repair work and influenced the appearance of historic buildings (Korn 1976).

1.1.3. Official Designation or Inscription

The complex's outstanding universal value was recognised by being added to the UNESCO World Heritage List in 1979 as part of the Kathmandu World Heritage Property, the first one to be listed in Asia.

(map 2) The brief synthesis of the World Heritage inscription states:

<<Located in the foothills of the Himalayas, the Kathmandu Valley World Heritage property is inscribed as seven Monument Zones. These monument zones are the Durbar squares or urban centres with their palaces, temples and public spaces of the three cities of Kathmandu (Hanuman Dhoka), Patan and Bhaktapur, and the religious ensembles of Swayambhu, Bauddhanath, Pashupati and Changu Narayan. [...] These monuments were defined by the outstanding cultural traditions of the Newars, manifested in their unique urban settlements, buildings and structures with intricate ornamentation displaying outstanding craftsmanship in brick, stone, timber and bronze that are some of the most highly developed in the world.>>

In addition, the complex is declared a Protected Monument Zone (PMZ) under the Ancient Monument Preservation Act 1956 and thus enjoys the highest level of national protection.[3]

Map. 2. Patan Durbar Square Monument Zone. Proposed Redefinition of core and buffer zone boundary (UNESCO, ICOMOS Evaluation, 2006)
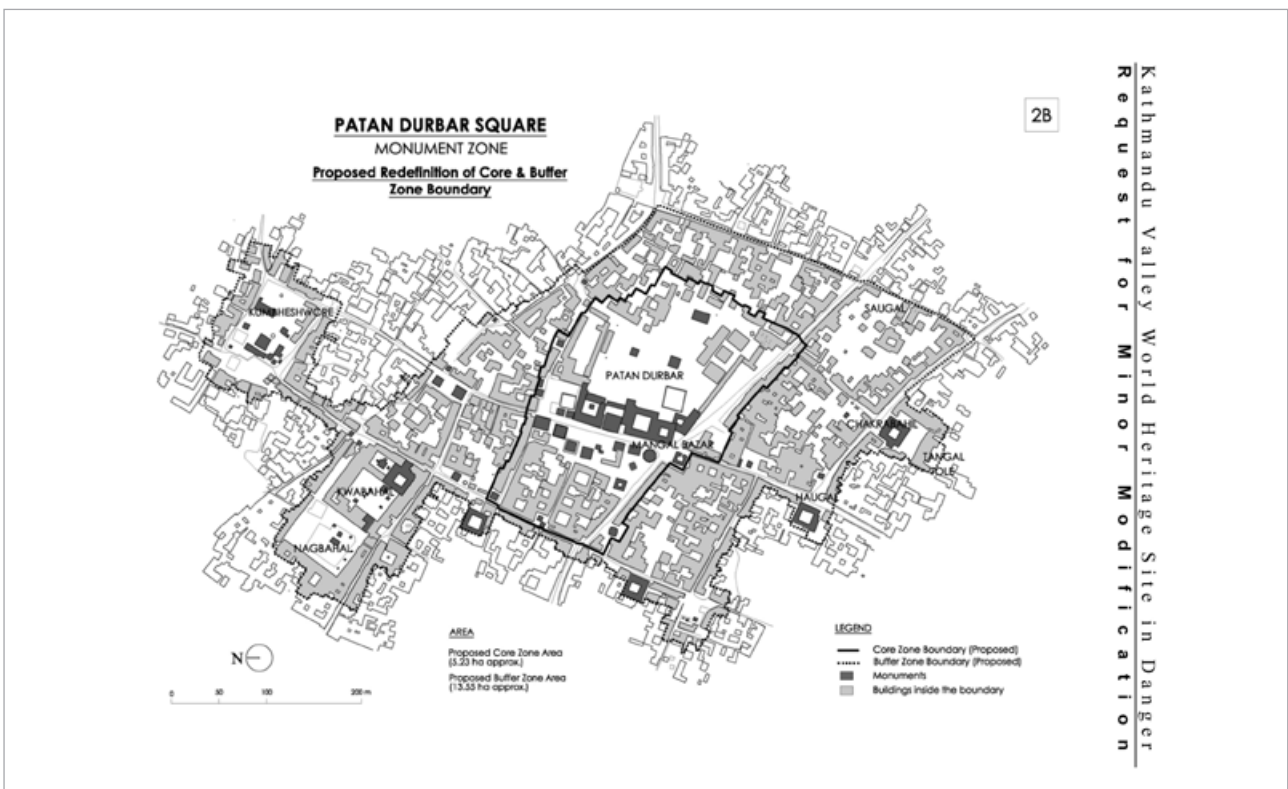
The Kathmandu World Heritage Property was inscribed based on criteria (iii), (iv) and (vi), which focus on the living culture and traditions, the exceptional architectural ensemble and the association to belief, art and other intangible attributes of outstanding universal significance.

More explicitly, the significant features, elements and attributes that express the outstanding universal value, are summarised in the Integrated Management Framework IMF) for the Kathmandu World Heritage Property, (Department of Archaeology 2007):

<<The unique architectural style of the palaces, temples, stupas and other monuments that are defined by their form, scale, structure and materials; The highly developed craftsmanship of the structures and ornamentation; The urban structure, the character of urban fabric and the distinct natural environment that create the context within which the monuments are situated; And the traditions and functions that bind the monuments to their distinct context, in particular the beliefs, legends, rituals and festivals.>>

The IMF is an integrated and comprehensive management plan for the entire property and also forms the legal framework for the conservation and maintenance of the listed and protected monuments within the World Heritage sites. Therein the guiding conservation principles are <<to preserve and maintain all those elements and attributes that contribute to the value of the historic building / structure for which the monument has been listed and classified in the inventory>> and <<to ascertain that all other elements and attributes are compatible and appropriate to the building / structure and its context>> in respect to <<mass (height, coverage and form) and exterior (material, colour, texture, order, scale and proportions)>> (Department of Archaeology 2017: 23).

During the recovery process after the earthquake in 2015, these designations have been taken into account, although in Patan it was thought to consider and treat World Heritage and other built cultural heritage as equal in value.

1.1.4. Scholarly Recognition

The Kathmandu Valley is well-known for the wealth, variety and quantity of its architectural heritage gathered in a small area. The remarkable character of the monuments and ensembles is highly recognised by international scholars. The Patan Monument Zone has attracted international scholars since the nineteenth-century (fig. 9). It is addressed in records and publications compiled in the course of expeditions by the British Royal Geographical Society (e.g. Johnston & Hoffmann 1883), the Royal Asiatic Society London, as well as by individuals including Henry Ambrose Oldfield (on site between 1850 and 1863),
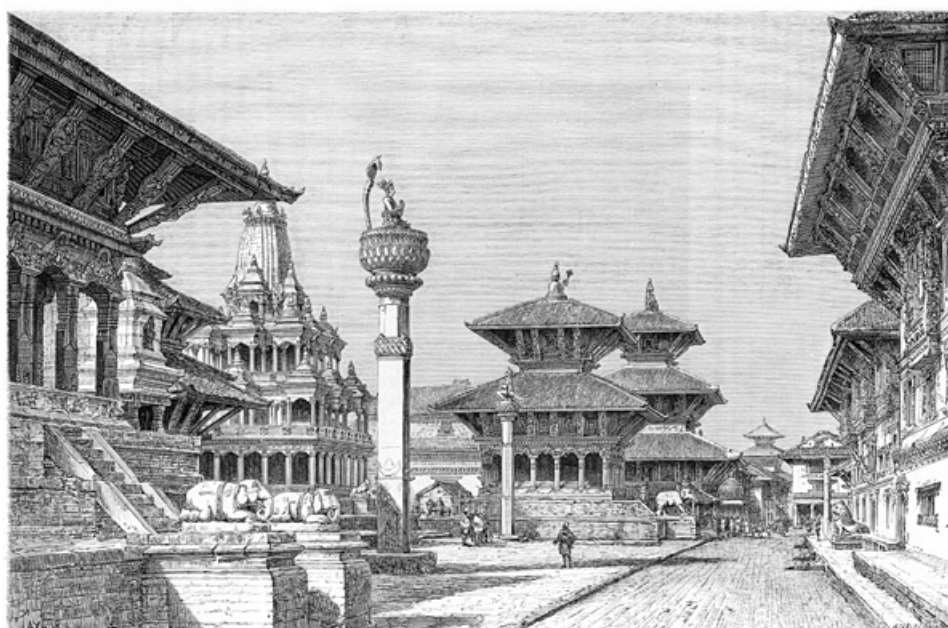
Fig. 9. Patan Durbar Square, (Gustave Le Bon, 1885, published in Le Bon, G., 1886. Voyage au Nepal, Le Tour du Monde. Paris.)

Gustave Le Bon (1886), Kurt Boeck (on site 1899, publication in 1903), Perceval Landon (1928) and Rajman Singh. With the opening of the country in the 1950s and the inscription of the seven sites in the list of World Heritage, the cultural heritage in the Valley and at the Patan Durbar Square finally moved into the centre of global attention and interest.

Worth mentioning are the studies on the country and people of Nepal by Daniel Wright (1877) and on the unique architecture and its attributes found in the Valley by N. R. Banerjee (1980), Niels Gutschow (1982, 1997, 2011), John Sanday (1979) and Wolfgang Korn (1976, 2014, 2015). Particularly the highly elaborated iconographic programme depicted in the monuments' complex ornamentation and decoration has attracted researchers (compare publications by Niels Gutschow, Mary Slusser, Adalbert J. Gail). Archaeological surveys in Patan were mainly compiled by archaeologist Sukra Sagar Shrestha.

Nepalese art and culture as well as rituals, traditions and religion have been equally recognised by scholars. Worth mentioning is the research done by Mary Slusser and the books of Saphalya Amatya.

Austrian architectural historian Eduard F. Sekler drafted the first and only *Master Plan for the Conservation of Cultural Heritage in the Kathmandu Valley* (1977) and dedicated his research to the safeguarding and preservation of its outstanding cultural heritage. Likewise future-orientated was the research of the Austrian architect Carl Pruscha, who focused on town planning and physical development of the Kathmandu Valley. He compiled the first complete *Kathmandu Valley Protective Inventory* (1975, rev. 2015), which is still valid today. Rohit Ranjitkar (1997) analysed the preservation efforts in the Kathmandu Valley in recent decades for the first time. Monument conservation in Nepal is discussed by Amatya (2007). Major revitalisation and restoration projects in the Valley are adressed in the publications of Götz Hagmüller (2003).

Craftsmanship is addressed by Bonapace and Sestini (2003) and in more detail by Vaidya and Gajurel (1984). Less attention has been paid so far to conservation scientific reserach. To date, research carried out by

Gabriela Krist and her team of the IoC since 2010 and compiled in publications and diploma thesis comprises the main source in this context.

1.1.5. Popular Recognition

Durbar Square in Patan is highly valued by the locals and the people of Nepal.

It is a vivid example of is a living cultural heritage. Unlike the situations that pertain in many parts of the industrialised world, it plays an important role for the community and is intensively used by the resident population and visitors. The square is the background and stage of daily life. Open spaces and rest houses are important recreation areas and social meeting places (fig. 10). The significance of the monuments particularly results from their religious function and the associated traditions (figg. 11-12). Throughout the year, worshipping and important multi-day events, such as the processions during the chariot festival of Rato Matsyendranath, take place (Sekler 1979: 100). Some monuments are thereby more *important* than others, depending on the deity they are dedicated to or the beliefs and festivals associated with them.

The community is not only interested in the *use* of the built cultural heritage but is also closely involved in its preservation. In former times, care and conservation of the monuments was a community-based responsibility that was assumed by the Guthis. Guthis are associations of people with different responsibilities ranging from performing everyday rituals and caring for temples to the organisation of big events. This system can be traced back to the fifth-century CE (Maharjan n.y.). With the nationalisation of Guthis in 1964 their participation and activity in this field has decreased (Department of Archaeology 2007: 31). Today, many Guthis no longer perform this responsibility or are struggling for members among the younger generations.

The monuments on Durbar Square are also repositories of traditional knowledge and workplaces for a wide range of locals. Following the concept of cyclical renewal, which has been sustained in the region over centuries, damaged elements or monuments have always been replaced or rebuilt by craftspeople (Jing, Forbes, Wijesuriya 2016: 6; Shrestha 2018: 111). This approach goes beyond the response to the devastating impact of the two main

natural hazards the monuments are exposed to – dampness and earthquakes (Department of Archaeology 2007: 5). The cyclical renewal also gives the descendants of the creators of built cultural heritage the chance to perform their skills and craftsmanship using their own experiences. This has kept craftsmanship alive and guaranteed its continued practice. Further, new additions in technology or materials to decorate or strengthen the monuments can be introduced. Both should either reflect contemporary needs and taste or help to *improve* the monuments to achieve primarily greater earthquake resistance (UNESCO, Weise 2015: 39; Shrestha 2018: 111).

Today, the practice of cyclical renewal is considered as an inherent aspect defining the character of the monuments and plays an important role in the recovery and reconstruction after the earthquake (Department of Archaeology 2007).

For the global audience, particularly tourists, the heritage site is mainly recognised as one of the main attractions in the Valley. This is also reflected in the fact that it is a popular photo motif[4] and illustration in travel brochures and advertising, and that its monuments are featured in the business logo of the Nepal Tourism Board.

▶
Images, Clockwise from top left:
Fig. 10. Historic structures at the square are used as recreation areas and meeting place (Institute of Conservation, University of Applied Arts Vienna, 2019)
Fig. 11. Sculptures and idols at the square are worshipped throughout the year (Institute of Conservation, University of Applied Arts Vienna, 2017, photo by Christoph Schleßmann)
Fig. 12. One of the countless festivals taking place at the Patan Durbar Square (Institute of Conservation, University of Applied Arts Vienna, 2018)

1.2 History and Context

1.2.1. History, Ownership and Environment

Patan is considered the most ancient among the three main cities of the Kathmandu Valley. At the time of construction its Durbar Square was in a rural to peri-urban setting, but already at the intersection of two main roads (Sekler 1979: 99). Today, the square is located within the vibrant urban heart of Patan.

The beginnings of Nepal's history are told in the realms of myths and legends. Following a number of dynasties, which ruled the country from the fourth to the third centuries BC, the Licchavi dynasty was the first where knowledge is on firmer ground. The main contributors to the Nepalese cultural heritage however were the Mallas (c.1201–1769). In the eighteenth-century the Shah dynasty took power and consolidated the state into the modern and unified Kingdom of Nepal. It was only in the middle of the nineteenth-century that increased contacts with the outside world and Europe were established. In the following decades the effective government of the country was wrested from the Shah king by the Rana family (Sekler 1977: Appendix V). With the Local Self Governance Act 1999 Patan came under the jurisdiction of the Lalitpur Sub-metropolitan City (Department of Archaeology 2007: 2). Today, the temples and monuments belong to government, although they are mainly managed and used by the community.

A chronological history and overview of conservation and restoration interventions carried out in the twentieth-century in the Kathmandu Valley is available in the dissertation of Rohit Ranjitkar (1997).

Ranking among the most disaster-prone countries in the world, Nepal has been highly susceptible to a wide range of natural disasters, such as earthquakes, landslides and floods (Ghimire 2015: 37–57). Earthquakes are considered the main natural hazard. They have caused great damage to cultural property in almost every century. The seismic vulnerability of the region is mainly due to its geographic location and to tectonic movements as well as the soil sedimentation (Maskey 2015: 284).

Some historic structures are also vulnerable in

themselves due to the traditional way of building. Masonry structures have strong behaviour in compression but are generally weak in tension and thus less earthquake resistant (Kuinkel, Sukubhatu, Shrestha 2019: 160). To counteract this, in Nepal a simple plan configuration (regular shape, low rise, limited area of openings), a symmetry of design and timber to reinforce the brick masonries have been used (Maskey 2015: 285). However, the use of low-quality material and lack of regular maintenance caused collapses in the recent earthquake. Another problematic area is the threshold level (base) of tiered temples: The lack of horizontal connection between threshold base stones allows them to shift and move independently during an earthquake. The vertical connection between the timber columns and the base are usually made with tenons, which are often undersized and pull out during an earthquake. Both can lead to collapse of the whole structure. Further, the composition of the brick masonry walls (exterior and interior brick layer with rubble infill between and no proper bonding) as well as the heavy roof structures combined with weak connections between roof overhangs and supporting struts are considered problematic construction patterns (KVPT 2016: 55-61).

Nepal's built cultural heritage is also particularly vulnerable to dampness. It is favoured by the climatic conditions in Nepal with humid summers and heavy precipitation during monsoon periods from June to September.[5] Both cause frequent water ingress and moisture penetration in building materials and accelerated weakening and deterioration (e.g. rotting timber). A major vulnerability of traditional construction systems is that they very seldom include damp-proof layers, humidity isolation or vapour barriers towards the ground (Korn 1976: 149; KVPT 2016: 59).

In addition, human activities and man-triggered hazards pose considerable threats to the heritage resource. As in other less-developed and developing countries, the historic structures are particularly threatened by urbanisation, infrastructure development and population growth. These hazards manifest themselves in urban sprawl, loss of open space, uncontrolled rise of concrete structures and various forms of pollution. Another possible threat is migration as it creates a more heterogeneous composition of population and

in turn might lead to disconnection of the community with its heritage (KC, Karuppannan, Sivam 2019: 434). Heavy traffic causes vibrations damaging weak walls and foundations. Due to the threat of uncontrolled development, the heritage site, as part of the Kathmandu Valley World Heritage Property, was already added to the List of World Heritage in Danger in 2003 (Jing, Forbes, Wijesuriya 2016).

Being a major tourist attraction, the heritage site is further vulnerable to adverse impacts of mass tourism. For better illustration: in 1964 a total of c. 9,500 visitors came to Nepal, in 2014 already 790,118, in 2015 due to the earthquake only 538,970 and in 2018 Nepal received a record 1,173,072 visitors (Nepal Tourism Statistics, Government of Nepal). The uncontrolled establishment of shops at and around Patan Durbar Square, building booms and increased wear are well-known problems.

Another weakness is inadequate restoration and repair measures using inadequate or poor materials. After the earthquake in 1934, restoration work suffered from lack of resources and materials. Consequently, often inferior quality materials were used. The use of improperly fired bricks of substandard quality is reported. Further, the widespread and ill-considered use of pure cement for restoration and pointing purposes was detrimental to the physical environment of the heritage resource (Krist, Milchin, Haselberger 2016; Leiner 2011). Salvaged elements were re-integrated in reconstruction work, but not necessarily in the correct position or manner (UNESCO, Weise 2015: 39). In some cases, rebuilding was done in great haste to satisfy immediate needs (e.g. Fasi Dega temple, 55-Window Palace both in Bhaktapur) or in poor quality (e.g. Sundari Chowk of Patan Royal Palace) (KVPT 2016: 12).

A recurring problem is lack of continuous care and maintenance of monuments, which causes increased deterioration of building materials, especially during the monsoon. Although it is acknowledged among local experts that regular care and maintenance have to be considered, attempts to introduce care and maintenance concepts in recent years have so far failed. The widely distributed assumption is that these kinds of activities, namely the implementation of protective, regular measures to keep a monument in good condition and

minimise the amount of wear, are not part of important work in the local context. It seems that maintenance is somehow not an interesting issue for people in Nepal, as can also be observed elsewhere in Asia. People prefer to build new temples in new areas or contribute new elements to existing temples in order to earn good karma or publicity than to do small works and repairs that are less *rewarded.* Furthermore, some craftsmen prefer to make their own design rather than copying old details or pieces. They further believe that it is easier to produce something new rather than replicate worn out originals with barely visible details.

It is hard to say how important a role care and maintenance played in the past. Some historic photographs and sketches from the nineteenth-century reveal monuments that are neglected and not well cared for. Nevertheless, it is assumed that there was a regular maintenance carried out by Guthis, which were well established at that time.

Today, the main maintenance carried out is on damaged or non-functional elements which are renewed and replaced using traditional craft skills. Endeavours are made by KVPT together with the community and partners to strengthen the concept of regular maintenance and care in the local context (refer to 3.5.).

1.2.2. Social and Economic Setting

In 2019, Nepal's population amounts to 28.61 million – Patan is among the most populated cities (World Population Review 2019). The population can be described as multi-ethnic and houses different cultures. In the Kathmandu Valley the major ethnic group are the Newars. They are a core community with regard to the local living heritage, rituals, festivals and activities (KC, Karuppannan, Sivam 2019: 434) and are further known for their highly developed craftsmanship and their contributions to culture, art, literature, trade and agriculture (Lieberman 1995)*.* Their skills, particularly in the field of crafts, are a major resource in the reconstruction process.

With regard to the economic settings, Nepal is one of the least developed nations in the world. Agriculture is the mainstay of the economy and most of the population is engaged in it (Rose 2019).

The tourism sector is an expanding branch in Nepal and an important source of income and employment, particularly in the Kathmandu Valley (GSIDS 2016). The earthquakes in 2015 set back economic development considerably (Nepal Economy Profile 2018).

1.2.3. Frameworks, Agents and Communication

In 1977 the UNESCO Master Plan for the Conservation of the Cultural Heritage in the Kathmandu Valley compiled by Eduard F. Sekler was adopted as official government policy. It deals with legal and organisational measures, planning and implementation of conservation and the improvement of infrastructure (Sekler 1979: 104).

Another framework is the Integrated Management Framework (IMF). It was prepared by the Government of Nepal and the Department of Archaeology in close collaboration with the World Heritage Centre and the UNESCO-Kathmandu Office in 2007 to comply with the request of UNESCO and the Operational Guidelines for the Implementation of the World Heritage Convention of 2005 (UNESCO 2005: 26; Jing, Forbes, Wijesuriya 2016). The IMF specifies and enumerates responsibilities and authorities in the management of the Monument Zone. It is supplemented by the Integrated Plan of Action and Management Handbooks.

Relevant key agents and stakeholders are disseminated on all levels. The authority within the Central Government that is responsible for protected monuments and the World Heritage sites as well as heritage conservation, monitoring, maintaining inventories and coordination is the Department of Archaeology (DoA) under the Ministry of Culture, Tourism and Civil Aviation. The municipality (Lalitpur Metropolitan City) provides grants and advice for restoration and recovery projects (e.g. Bhimsen Temple, Baidegah Temple).

A particularly important actor in the heritage sector is the community. Today, it is active in the form of small organisations (e.g. Cultural Heritage Conservation Group in Patan), who implement their own restoration projects (e.g. Baidegah Temple). In former times, the management and preservation of monuments constituted a community-based approach and were carried out by Guthis. As previously mentioned, most of them became non-operational after their nationalisation in 1964 to a centrally organised unit, the Guthi Sansthan. Due to diminished community support and lack of funds since then, the Guthi Sansthan's role has been considerably reduced to basically performing religious festivals (IMF).

The main INGO involved in heritage conservation and preservation in the Patan Monument Zone since 1991 is the Kathmandu Valley Preservation Trust (KVPT). It is a qualified national player in the field of preservation with the mission to safeguard the cultural and architectural heritage of the Kathmandu Valley.[6]

Other international actors present in Patan contribute financial support, technical advice and assistance or practical support in conservation-restoration and recovery. The latter applies to the Institute of Conservation at the University of Applied Arts (IoC), which has been collaborating with the KVPT in the conservation of cultural heritage on Patan Durbar Square since 2010.[7]

An important channel of communication among the stakeholders is the KVPT Steering Committee, which is chaired by the DoA and comprises representatives of the DoA, the KVPT, the municipality (Heritage Department) and the Patan Museum as well as local wards chairmen, district officers and other stakeholders from the area. It brings the community together regularly, which enables problem solving and enhances understanding and acceptance among the community.

2. The Nature of the Impacting Events

2.1. General Description

The Kathmandu Valley and its cultural property have been vulnerable to earthquakes throughout history. In the past, great earthquakes have occurred approximately every 80 to 100 years, with major events being recorded in 1408, 1681, 1810, 1833, 1866, 1934, 1980, 1988, and 2011 (KC, Karuppannan, Sivam 2019: 434; Dahal 2015: 1-2; Weise 2018: 79).

On 25 April 2015, shortly before noon, the most recent disastrous earthquake struck the valley, measuring a

magnitude of 7.8 and lasting approximately two minutes. Its epicentre was located 81 km northwest of Kathmandu at a depth of 15 km (USGS 2019). This so-called Gorkha Earthquake is considered the first great quake after the 1934 Bihar earthquake (Shrestha 2018: 105). In the aftermath, the region was haunted by daily smaller aftershocks, with a major one occurring on 12 May (magnitude of 7.3) (USGS 2019).

2.2. General Impact of the Events

Beside the humanitarian catastrophe with almost 9,000 deaths and 22,000 injured (APP 2018: 21), the earthquake caused enormous damage to vernacular architecture and historic structures of cultural and religious value. According to the Post Disaster Needs Assessment (2015) about 2,900 structures of cultural, historical or religious value were affected. Altogether 691 historic buildings in 16 districts were damaged, among them 131 fully collapsed (Government of Nepal National Planning Commission 2015; Manhart 2018). The built cultural heritage in all seven monument zones comprising the Kathmandu World Heritage Property suffered damage.

A well-rounded view of the damage, loss and recovery needs and analysis of the overall impact of the earthquake is provided in the Post Disaster Needs Assessment.

The earthquake hit the country in the middle of the first of two high tourism seasons and immediately discouraged cultural and other forms of tourism. Many workers in the tourism sector (tourist guides, restaurant and hotel staff, etc.) thus lost their jobs. As tourism is considered to form the backbone of Nepal's present economy, the country suffered major economic losses in the following years (Government of Nepal National Planning Commission 2015: 117, Vol. B). From almost 800,000 tourists in 2014, the number of tourist arrivals declined by 32 per cent to about 540,000 in 2015, as indicated in the Nepal Tourism Statistics issued by the Government of Nepal.

Another effect is that a large number of workers left urban centres to provide relief support to their families and communities in the villages (Government of Nepal National Planning Commission 2015: 217, Vol. B). Others

were preoccupied with the effects of the disaster on their own livelihood and committed to the recovery of their own private houses. Both resulted in decreased availability of human resources for the safeguarding of common cultural heritage in the urban area.

The earthquake also had a considerable impact on social, religious or ritual practice(s) and customs. Pilgrimages came to an almost complete halt as people were either busy with the repair of damage caused by the disaster or because roads to sites had been cut off (Government of Nepal National Planning Commission 2015: 69, Vol. B). Due to the destruction or inaccessibility of certain monuments and sites, worship and rituals were impeded.

2.3. Impact on the Significance and Values of the Resource

The earthquake affected both tangible and intangible significance-defining elements of Patan's heritage site (fig. 13). It caused the complete destruction of some of its oldest historical structures, including the Charnarayana Temple (1565) and the Harishankara Temple (1706), leaving only their plinths more or less intact (fig. 14). Other buildings were severely damaged and although still standing were classified as unstable (KVPT 2016). The two mandapas, located north of the palace complex, dating from the fifteenth to the seventeenth centuries, also collapsed (fig. 15).

Two of the three free-standing stone pillars crowned by fire-gilded metal sculptures partially collapsed and caused breakages of pillar elements and deformations of the delicate sculptures – among them also the Pillar of Yoganarendra Malla (fig. 16). The fact that this former ruler of Patan added many tangible and intangible facets to the city of Patan during his reign still makes him a recognised personality in the valley and his memorial is probably the most significant feature of the square.

The Royal Palace suffered equally. One wing of Sundari Chowk collapsed completely and the three historic wings of Keshav Narayan Chowk, which houses the Patan Museum, were severely affected. Masonries lost internal integrity, façades of all wings are bulging outwards, wooden windows are deformed, timber elements such as cornices are broken, and bricks dislodged.

Two roof structures of the Taleju Temples, which are integrated into the structure of the Royal Palace, partly collapsed and had to be dismantled.

The physical destruction and damage simultaneously affected intangible cultural heritage, which is strongly linked to the built structures.

Offerings and rituals were interrupted at temples that collapsed (e.g. Harishankara and Charnarayna Temple) and were hampered at still standing, but classified as unstable, monuments (e.g. Krishna Mandir) due to temporary barriers. As the two public resthouses

on Durbar Square collapsed, important places for meetings and transmission of oral narratives were lost.

Despite these immediate constraints in accessibility, worship and festivals were rather quickly resumed in the aftermath of the earthquake. Daily offerings were brought to the idols of gods or other sacred objects still standing at the centres of collapsed temples or shrines. Some of the major festivals took place in the same year. A community leader of Lalitpur stated in this context:

<<After the earthquake, we made a lot of changes to

Images, Clockwise from top left:
Fig. 13. The Patan Durbar Square in the immediate aftermath of the earthquake in May 2015 (Kathmandu Valley Preservation Trust, 2015)
Fig. 14. One of the main monuments, the Harishankara Temple, collapsed completely
during the earthquake (Kathmandu Valley Preservation Trust, 2015)
Fig. 15. The two mandapas at the square collapsed (Kathmandu Valley Preservation Trust, 2015)
Fig. 16. The Pillar of Yoganarendra Malla partly collapsed (Kathmandu Valley Preservation Trust, 2015)

our festivals and processions, but we did continue them. This ensured the social and cultural continuity. [...] the community is willing to make changes to continue with their cultural heritage. This also shows that heritage helped people to come out of the traumatic situation and bring communities together.>> ⟨KC, Karuppannan, Sivam 2019: 437)

2.4. Emergency Documentation and Repairs

Emergency documentation of the condition and impact of the earthquake on Patan Durbar Square was mainly done in the form of digital photographs carried out by staff of the KVPT and the Patan Museum. The focus was to capture as much as possible with the available equipment (e.g. mobile phones) and human resources. Although this documentation followed no clear scientific procedure, it is a valuable source today. Its evaluation enables to assign

damage patterns to the earthquake and differentiate them from damage resulting from the recovery. Further, it gives hints on the cause of collapse (e.g. direction of tilting of monuments) and allows to identify theft or vandalism.

It is notable that in the immediate aftermath of the earthquake well-organised local communities started not only to rescue human beings but also to recover and secure unique architectural elements like statues and carved wooden elements (Manhart 2018). Some local people even rushed to the site immediately after the earthquake to protect artefacts from theft. The overall rescue and recovery of works of art was coordinated by the DoA together with the KVPT. It was carried out with the help of local stakeholders, the local community and the Nepal Army, the Armed Police Force and the Police (figs. 17-18).

▶
From top to bottom:
Fig. 17. Artefacts and decorative components were manually recovered from the debris of collapsed temples (Thomas Schrom, 2015)
Fig. 18. The recovery of elements was jointly carried out with the help of local stakeholders, the local community, the Nepal Army, the Armed Police Force and the Police (Kathmandu Valley Preservation Trust, 2015)

Artefacts and decorative components from collapsed temples were manually recovered from the rubble and debris. The use of heavy machinery was avoided. The salvaged components were documented and subsequently stored in a safe environment (figg. 19-20). For this purpose, temporary storage facilities (metal shelters) were erected in the palace garden by KVPT (fig. 21). The shelters are locked up and the garden is only accessible via the entrances to the museum which enables access control. Further, the location provides enough free space away from other monuments in danger of collapsing. The erection of the shelters was one of the first and most important response measures. It was substantially supported by the Austrian partner. Later open-air workshops were integrated to store, study, re-assemble and repair or replicate architectural pieces (KVPT 2016: 13) (fig. 22).

Still standing, but affected monuments were temporarily shored and stabilised with wooden and steel props (fig. 23). Buildings with damaged roofs were covered with tarpaulins to prevent water infiltration and particularly to prepare them for the heavy rains of the approaching monsoon (fig. 24). Damaged monuments were fenced and access restricted for safety reasons.

From today´s point of view these immediate activities proved to be very important for the preservation. They prevented not only further loss, theft or vandalism to exposed decorative and structural components, but also avoided accelerated weathering of unprotected works of art caused by water infiltration, biological growth and salination in the monsoon period. Further, the salvage of construction materials meant considerable time and cost savings in the current phase of recovery and reconstruction as fewer new materials had to be purchased.

3. Post-Event Appraisals

3.1. Post-Event Documentation

In parallel to the emergency response measures, the documentation process was continued in the weeks after the earthquake. The main focus was on monuments that were in danger of collapsing. In light of probable aftershocks, their documentation from different views and angles was important.

An in-depth documentation of individual monuments has been compiled in the framework of their treatment. Each conservation-restoration and rebuilding effort is accompanied by detailed visual, graphic and written documentation. It includes photographic records, drawings, mappings and plans. The documentation is stored in the archive of the KVPT.

Among the existing pre-earthquake documentation, Wolfgang Korn's architectural studies and drawings from the 1970s, the comprehensive photographic documentation with complete views and close-ups of ornamentation of some monuments by Stanislaw Klimek (2007 and 2008) and records (plans, drawings, photographs) prepared by the KVPT since its establishment in 1991 as well as conservation reports of the IoC were of great value.

For specific monuments, which lacked pre-earthquake documentation, the in-depth survey and assessment of their foundations and (recovered) building elements provided sufficient evidence to reconstruct layouts, dimensions and forms.

3.2. Impact Assessment

Until now, there exists no detailed impact assessment for Patan Durbar Square. Assessments were carried out by DoA and UNESCO teams (Government of Nepal National Planning Commission 2015: 69, Vol. B). Due to the limited time reserved for this venture (1 day), the assessment remained quite superficial and is not sufficient for technical purposes.

An additional assessment was carried out by the IoC in the framework of a fact-finding mission in June 2015. It comprises visual (photographs) and a short-written documentation of the state of condition (minor damage, major damage, collapse). It provided the main base for the application for funding.

A general impact assessment constitutes the Post Disaster Needs Assessment (PDNA), which was conducted in July 2015.[8]

Images, Clockwise from top left:

Fig. 19. Salvaged elements were brought to the palace courtyards (Kathmandu Valley Preservation Trust, 2015)

Fig. 20. Salvaged elements were documented and inventoried in a safe environment (Thomas Schrom, 2015)

Fig. 21. View into the newly erected storages (shelters) in the palace garden (Institute of Conservation, University of Applied Arts Vienna, 2016)

Fig. 22. View at the open-air workshops, which were created next to the storage (Institute of Conservation, University of Applied Arts Vienna, 2017)

Fig. 23. The affected Vishveshvara Temple at the square was temporarily shored with wooden props (Institute of Conservation, University of Applied Arts Vienna, 2015)

Fig. 24. The damaged wings of the Royal Palace were covered with tarpaulins (Institute of Conservation, University of Applied Arts Vienna, 2015)

This assessment is a documentation and analysis of recovery and development needs covering 21 sectors. The appraisal for the cultural heritage sector was accomplished with major inputs from the Kathmandu UNESCO office, but also lacks detailed surveys and technical data of individual monuments.

3.3. Challenges for Recovery

The complexity of the recovery and the large number of monuments affected have implied several challenges on the organisational, administrative and executive level since 2015.

In the aftermath of the earthquake, the blockage of the border with India, which was triggered by the proclamation of the revised constitution, resulted in a considerable shortage of goods and a fuel crisis. It augmented the already existing scarcity of resources and impeded recovery and reconstruction efforts. Long-lasting bureaucratic procedures and governmental approval procedures as well as lobbying against seismic strengthening have posed a continuous obstacle to recovery.

From the technical perspective, one of the biggest challenges is to weigh the use of traditional technology and materials against the demands for increased safety. Some votes insist on the sole use of traditional materials and techniques, although they might not withstand seismic events. Others are only worried about improved earthquake resistance and safety issues. They accept the complete demolishment of historic structures and their reconstruction with modern materials. These two interests must be balanced.

Further, the *living character* of the monuments has to be considered. The Basic Guidelines for the Preservation and Rebuilding of Monuments Damaged by the Earthquake issued by the Nepalese Government stated in this context that <<while restoring or rebuilding, arrangements should be made to implement and continue intangible cultural heritage, preserving the traditions, rituals, or norms and values attached to such monuments>> (Government of Nepal 2016). At the same time this respect of intangible cultural heritage and religious issues can restrict accessibility or cause work interruption. Throughout the

overall recovery, the threat of aftershocks is omnipresent and adequate safety precautions have to be taken (e.g. shoring, safety briefings of people working on site, etc.).

3.4. Responses and Recovery Programme

The KVPT and the IoC have been collaborating in the preservation of built cultural heritage in and around Patan Durbar Square since 2010. After the earthquake they agreed to continue and intensify their joint efforts and contribute to the overall response and recovery. In order to place the project on a solid financial base the University of Applied Arts Vienna approached the Austrian Federal Chancellery and the Austrian Foreign Ministry to request financial assistance in the recovery of cultural heritage in Patan. Austria and Nepal look back on a long history of collaborative relationship. Nepal had not only been a focus of Austrian development aid, but the Austrian government has also supported major revitalisation and restoration projects of cultural heritage in the past (i.e. Patan Museum). A considerable number of Austrian scholars were and still are active in researching, studying and safeguarding cultural heritage (i.e. E. F. Sekler, C. Pruscha, G. Hagmüller). This background guided the decision of the Austrian government to award grant funds in a whole-off government approach to be spent on the recovery and conservation of Patan Durbar Square and the Royal Palace. It was the starting point for the joint project.

The action plan of the project was aligned with the 5-year response and recovery programme elaborated by the KVPT (Patan Darbar Earthquake Response Campaign). This in turn is orientated towards the overall recovery plan for Nepal, which proposed six years for the restoration and reconstruction of all damaged and collapsed historic buildings (Government of Nepal National Planning Commission 2015).

For the Patan Darbar Earthquake Response Campaign a manageable number of twenty restoration and reconstruction projects was selected, which could be concluded in the foreseen time in an appropriate manner. Among them the focus is on the five most significant structures of the square – the Royal Palace, the Charnarayana Temple, the Harishankara Temple, the Visveshvara Temple, and Krishna Mandir – and the two manimandapas. Three of these focal monuments, the

▶

Fig. 25. Historical elements were re-used and only considerably damaged parts were partially replaced – in this case the top profile was replaced with a stone indent made by a local stone mason (Institute of Conservation, University of Applied Arts Vienna, 2018)

Charnarayana, the Vishveshvara and the manimandapas, were chosen as model projects for seismic strengthening. They exemplify issues common to many other historic structures, which collapsed or suffered damage in the earthquake. Thus, they are used to target the typical key challenges Nepal faces in the current earthquake response. The campaign relies on the collaboration of international actors from the cultural heritage sector, with the IoC as the main partner in conservation, and the employment of adequately trained craftsmen to sustain the high level of traditional craftsmanship.

The guiding philosophy of the recovery programme adheres to accepted international charters and principles, namely the Venice Charter and the Nara Document on Authenticity and follows the concept of Building Back Better through the use of high grade materials and seismic strengthening. It aims at the:

a) preservation of the monuments in their authentic composition and appearance,
b) rebuilding of collapsed structures and the recovery of the pre-earthquake condition, and
c) reinforcement and retrofitting of still-standing monuments, which are significantly weakened.

One objective is thereby to use a maximum of historical (original) material. Salvaged decorative and building components are re-used for reconstruction or rebuilding. Elements are only replaced if they are considerably damaged and their load-bearing properties thus reduced (fig. 25).

Traditional materials and construction techniques are employed as much as possible. They are characterised in the course of a condition survey and damage assessment. For instance, interlocking techniques with timber and plug-in systems with stone dowels are re-used for mounting and re-assembling. If the traditional methods or materials fail or create a weak point in the structure, reinforcement, retrofitting and the introduction of modern materials (e.g. stainless steel) are considered, in line with the recommendations of the Venice Charter and the Nara Document on Authenticity. In many cases, the method of construction needs adaption. The connecting elements, such as dowels or pins, are dimensioned too small or are rotten and decayed, which is why the connections released during the seismic event. They are thus either renewed or an additional strengthening is introduced (e.g. stainless steel pins). Connections that are particularly stiff proved unsuitable in resisting the seismic forces. Their stiffness is often due to mortars and glues introduced in the framework of repairs in the twentieth-century. In the current re-assembling and rebuilding flexible connections are thus favoured to allow a certain lateral movement in the case of earthquakes.

All adaptions should make the monuments more seismic-resistant and therefore as safe as possible to withstand future earthquakes. They are in line with the need for *disaster risk reduction*.

An integral part of the programme is preliminary research, condition survey and planning. This included visual inspections supported by non- and low-invasive investigations and scientific analyses to determine the building materials, understand the construction methods and assess and characterise the damage patterns and deterioration mechanisms. Further, vulnerabilities and weaknesses could be defined. Based on this knowledge, tailored conservation concepts are jointly elaborated by the conservators of the KVPT and the IoC for each monument.

With regard to the choice of conservation materials and methods, the project team could refer to their working experience on site and knowledge gained from regular evaluation and monitoring of conservation measures implemented since 2010. The compatibility of applied materials with local building materials was tested in advance in Vienna. Test series and scientific investigations were done in the framework of a pre-diploma and diploma thesis. Their sustainability in the given environment and climatic conditions has been checked by regular visual inspections. In this way, for instance, recipes for pointing mortars could be further developed and refined in the recent decade. The earthquake performance of conservation measures was assessed in a condition survey after the earthquake in 2015. Thereby, the effectiveness of reinforcement measures (e.g. introduction of pins and clamps to connect individual blocks) could be proven.

The probably most important objective of the overall recovery programme is the creation of careful and extensive documentation of all efforts (prior status, working progress, final state) that will enable future generations to track the design and construction process (KVPT 2016: 13).

So far, it has been possible to fully recover the manimandapas and three of the five significant structures on the square. The Harishankara Temple and the manimandapas have been reconstructed.

The historical configurations were restored. Salvaged structural and decorative elements of the collapsed monuments were largely re-used. Problems typical to the multi-tiered temples (compare 1.2.1.) were addressed by strengthening techniques (e.g. reinforcement of connections using stainless steel dowels and plates, insertion of damp-proof layers). The IoC focused their support on the conservation of the temple's stone base and on the main idols and sculptures, which were situated inside the collapsed structures. At the Vishveshvara Temple and Krishna Mandir *in situ* repairs to stabilise and reinforce the affected structures were carried out. At the same time historic fabric was preserved. While the KVPT assumed the static restoration work, the IoC was entrusted with the conservation of the stone elements (base at Vishveshvara Temple and surfaces at Krishna Mandir) and the pointing of joints (Krishna Mandir). Reconstruction work at Charnarayana Temple is still in progress. The restoration work at the Royal Palace is only partly complete: so far the pinnacles of the North and South Taleju Temples, the collapsed wing of Sundari Chowk and one affected wing of Keshav Narayan Chowk have been treated.

In addition, it has also been possible to conclude several other conservation and restoration projects, such as the Lion Pillar and the Pillar of Yoganarendra Malla, or the works are in progress.

3.5. Values and Sustainability

Throughout the whole recovery process, sustainability is pursued in many ways. First, capacity building is an integral part. The KVPT links the employment of highly skilled craftsmen to capacity building to grow the community of craftspeople and enable transmission of knowledge to the younger generation. The IoC regularly includes craftsmen, staff of the Patan Museum and students of Nepalese universities (e.g. since 2018 students from Lumbini University) in the annual conservation work campaigns. In this way the participants gain knowledge and insights in basic conservation and restoration. Knowledge in these fields is not really available in Nepal due to lack of training and education (figg. 26-27).

From left to right:
Fig. 26. Highly skilled craftsmen are engaged in the recovery process (Kathmandu Valley Preservation Trust, 2018)
Fig. 27. Conservators of the IoC impart basic knowledge in conservation and restoration to craftsmen (Institute of Conservation, University of Applied Arts Vienna, 2018)

Second, the development of models in conservation, rebuilding and reinforcement comprise sustainable outputs of the recovery process. The Harishankara and the Charnarayana Temple have acted as (seismic) model projects to design schemes for the rebuilding and reconstruction of two variations of the multi-tiered temple (common and arcaded – with an open colonnade with pillars surrounding the sanctum – configuration). The reconstruction of the open timber-pillared manimandapas illustrated the challenges in <<balancing historical and technical, authenticity and seismic integrity>> (KVPT 2016: 84). The final design can be considered a model-like historically sensitive and earthquake-resistant solution. A range of structural improvements, seismic strengthening techniques and models for retrofitting, as opposed to demolition and overall rebuilding, have been elaborated in the framework of the treatment of Vishveshvara Temple and Krishna Mandir. Conservation efforts have been accompanied by detailed documentation, which can be used as reference in similar approaches. All of them can serve as guidance in future projects.

The maintenance and care of the recovered heritage resource has also been discussed. Currently they are of rather low significance in the common belief

(compare 1.2.1.), which is why the KVPT aims to use stable and low-maintenance technology and materials in the reconstruction and recovery (KVPT 2016). In the long term the objective should be to strengthen the concept of maintenance and care and anchor it in the heritage sector in Nepal. The challenge hereby is that this venture is a balancing act between preserving living heritage and historic fabric. Many monuments have been actively used since the day they were built. This use in turn can cause deterioration and damage. Banning or restricting the use for the sake of preserving the substance is not compatible with the idea of preserving traditions and intangible heritage. What has been done to solve this issue is that certain parts or rooms, that were no longer used, were adapted to generate income (i.e. as museum galleries). This income again helps to make the monument self-sustained and is used to maintain it. If this approach is not feasible, the KVPT works together with local stakeholders and communities to use a certain percentage of the entry fees to the World Heritage zone, which are collected by the Patan Metropolitan City from tourists, for maintaining the monuments. A maintenance plan for Patan Durbar Square, which was already proposed by the IoC in 2014 (Fuchs 2014), builds a valuable base for the efforts in this direction.

3.6. Drivers, Agents and Governance

Due to the long-term presence on site, the KVPT in coordination with the DoA is one of the main initiators and drivers of recovery at Patan Durbar Square. In addition, the local community of Patan is driving the recovery forward and initiates its own projects.

The IoC has been involved in almost all of the projects within the recovery process. It has provided technical support and advice and implemented assigned projects such as the conservation of specific parts of the monuments (e.g. base, roof, embellishment, etc.) or the conservation and re-erection of entire small monuments (e.g. free-standing pillars).

While this conservation work has been carried out by teams of experienced senior and junior conservators together with the KVPT, local craftsmen and external students, more comprehensive restoration work required the inclusion of building contractors. This applied for instance to the restoration of the Patan Museum building. A problematic issue in this context is that according to the Procurement Act and Procurement Regulations an open tender has to be called for construction work, and this also applies to interventions at historic structures. Due to this restrictive government law and limited funding, the DoA is obliged to accept the lowest bidder. This causes problems, because any contractors can place themselves in the bidding processes and many of the low-cost contractors are not sufficiently trained in heritage restoration. The problem is further exacerbated by the fact that some contractors try to make a profit by using the cheapest materials available and completing projects as quickly as possible (Pun 2018).

4. Response Actions, Timeframes, Resources and Costs

4.1. Actual Implementation and Timescales for the Recovery Programme

The project initially covered a period of three years, but was later prolonged until the end of 2019 due to delays in the implementation of certain projects and money reserves through the economical use of the funding. It was agreed that detailed annual action plans would be elaborated each year as long-term forecasting is not really possible. This means that individual conservation projects could be favoured, postponed or abandoned. Others could be easily added. For example, several small objects and works of art were found during clean-up efforts that need conservation treatment.

In general, the funding partners have been very responsive and showed the necessary flexibility with regard to the extension of project durations, postponement of deadlines or amendments in the time schedule. These were mainly required due to the following constraints: long decision-making and bureaucratic procedures as well as the limited work opportunities on site of the Austrian conservators (lecture-free time, not during monsoon).

Currently, the application for a three-year follow-up project is under preparation.

4.2. Resources and Costs of Implementation

The KVPT and the IoC both provided adequate human resources and technical and organisational capacities for the implementation of the project.

The Institute of Conservation is a renowned centre of competence in the field of cultural heritage preservation. Its head Gabriela Krist has held the UNESCO Chair on Conservation and Preservation of Tangible Cultural Heritage since 2019. The Institute is highly regarded both nationally and internationally not only for its training and education of academic conservators in the fields of stone, object, textile and paintings conservation but also for its international conservation (research) programmes in South and East Asia, i. e. in India, Mongolia and especially in Nepal.[9] The team from the Institute consists of experienced senior conservators, heritage scientists and photographers. Infrastructural capacities include workshops and laboratories equipped with up-to-date investigation and working tools.

The KVPT is an international not-for-profit organisation dedicated to safeguarding Nepal's extraordinary architectural heritage. Founded in 1991 by architectural

historian Eduard F. Sekler, the KVPT today employs permanent staff members (i.e. conservation architects, engineers, etc.), external consultants as well as experienced craftsmen to maintain a good quality of work. It has profound experience in safeguarding, conservation and adaptive reuse of historic structures in Nepal with a particular work priority on the Patan Royal Palace.[10] An archive of architectural research and documentation maintained by the KVPT provides an important source for conservation and reconstruction measures.

Due to the long presence of the KVPT and the IoC on site, costs for materials and labour as well as expenses arising from travel and accommodation have been known and the gained experiences were transferred to the calculation of costs for the project.

5. The Outcomes and Effects

5.1. Assessment of the Outcomes with Regard to the Recovery

The outcome of the recovery to date meets the expectations and plans formulated at the beginning of the project.

The achievements so far comprise the thorough conservation, restoration and reconstruction of most of the significant structures that are integral parts of Patan Durbar Square (compare 3.4.). The Krishna Mandir and Vishveshvara Temple underwent structural rehabilitation and conservation, the Harishankara Temple was reconstructed, the reconstruction of Charnarayana Temple is still in full progress and work at the Royal Palace was partly accomplished. Apart from the work on these priorities, the conservation and re-assembling of two partly collapsed free-standing pillars together with their crowning sculptures (Lion Pillar and Pillar of Yoganarendra Malla) are among the main achievements (fig. 28).

Original and salvaged structural and decorative components of monuments could be re-used to a large extent after non-invasive investigations (e.g. ultrasound velocity measurements) verified sufficient strength and following their adequate conservation. Non-reusable

elements were equally conserved and partly exhibited in the museum galleries.

All these achievements are considered an important contribution to the recovery of this site of outstanding universal value and testament of Nepal's living heritage. Currently the next project phase of recovery, which directly attaches to the current response and will last until 2023, is under development (KVPT 2017: 6).

Systematic condition surveys and investigations further resulted in new insights with respect to building materials, construction methods and conservation history enlarging the overall knowledge on the heritage site.

Sustainability objectives with regard to capacity building were achieved. Each year between eight to seventeen craftsmen collaborated with the conservators and benefited from the on-the-job-training scheme in basic conservation. Furthermore, two staff members from the museum and four students from Lumbini University were integrated into the conservation work and trained.

All conservation-restoration projects were carefully documented in the form of reports that are available in the archive of KVPT. Selected projects were addressed, a diploma and two pre-diploma theses[11] were presented and disseminated at international conferences and symposia and published in postprints.[12] Conservation strategies and concepts are thus accessible and open for the interested community and can serve as orientation for future efforts in Nepal.

The recovery is perceived as positive from the local communities attached to the site and has positive implications for their social life and the local economy.

KVPT's announcement of plans for reconstruction within a week after the 2015 earthquake was perceived as a symbol of hope. The first restoration project, the re-assembling of the Lion Pillar, was already completed by spring 2016, on the one-year anniversary of Nepal's earthquake.

The visible and rather rapid progress on the square has given the local communities and neighbourhoods encouragement and energy to start their own initiatives.

Fig. 28. The Pillar of Yoganarendra Malla after the earthquake (left) and after its successful conservation and re-erection (right) (Institute of Conservation, University of Applied Arts Vienna, 2015-2017)

Local working committees are restoring and rebuilding with technical support from the KVPT at their sites. The progress also satisfies donors and gives them the feeling that their funds are well spent.

Restored as well as reconstructed monuments are in use and fully re-integrated in religious practice and daily life. Several monuments were already being used again and frequented by locals prior to their rebuilding or during their conservation and restoration. For instance, even without a temple building people worshipped Charnarayana, because the idol was on site (fig. 29). While conservators and engineers were working at the top level of Krishna Mandir for example,

rituals and offerings were performed by priests and worshippers on the floors below. For devotees it is not important that the monument is in place – the holy site and the idol are important.

As progress was made in the recovery, the return of tourists and visitors could also be observed, which contributed to the economic recovery. In contrast to other cities such as Kathmandu, Patan recorded more visitors as most of the main monuments, which were damaged or had collapsed in 2015, were already rebuilt. This in turn boosts tourism in and around the square and increases revenues from entry fees to the square and the Patan Museum.

Fig. 29. The worshipping of the idol at Charnarayana Temple continued although the temple building collapsed completely (Kathmandu Valley Preservation Trust)

One learning outcome is that the potential impact and influence of local communities in any recovery process should not be underestimated. In Nepal their protests and disputes among them have resulted in delays and complete stops of projects at some places. For instance, the restoration of temples in Hanuman Dhoka in Kathmandu was stopped and the reconstruction of Kasthamandap has only recently started due to that (Pun 2018). Thus, communication on all levels has been emphasised within the project to allow a high degree of transparency. Dialogue and exchange were particularly promoted with the local residents, tourist guides and religious leaders in Patan to generate acceptance and endorsement among the public.

To sum up, the good collaboration between all involved international parties enabled the successful recovery of the earthquake-affected square within a short period of time. In contrast, in other areas of the Kathmandu Valley and the cities of Kathmandu and Bhaktapur, these results have not been achieved so far. In some cases, recovery has not even started.

6. Details of the Expert(s) Completing the Case Study

Prof. Mag. Dr Gabriela Krist has been head of the Institute of Conservation since 1999. She has also worked as programme officer at ICCROM and the Austrian Federal Monuments Office. Her research interests focus on conservation and technical art history aiming at developing object-based preservation and conservation concepts as well as preventive conservation and collection care. Spanning more than 45 years, her career has brought substantial working experience in South and South East Asia (Nepal, India, Mongolia, Myanmar, Thailand) and leadership of interdisciplinary research projects. Since 2019 she has held the UNESCO Chair on Conservation and Preservation of Tangible Cultural Heritage.

Mag. Martina Haselberger, an academically trained stone conservator, is a university assistant at the Institute and has participated in fieldwork in Nepal, India and Mongolia. Her research interests include theory and practice in stone conservation, cultural heritage

protection and disaster preparedness. Since 2017 she has been attending a Master Course in Cultural Heritage Protection at the Danube University in Krems, Lower Austria, intensifying her expertise in this specific field.

Dr Rohit Ranjitkar, an architect and preservation consultant, serves as the Nepal Programme Director of the Kathmandu Valley Preservation Trust (KVPT). His research includes the documentation and study of conservation practices in Nepal. He has worked in the field of architectural conservation with the KVPT since its establishment in 1991 and is responsible for the selection, design, and implementation of the restoration projects as well as fundraising, training and negotiations with local officials and communities. In addition, he implements new architectural projects with a focus on the adaptive reuse of old houses.

Notes

[1] The term "pagoda" used in the European context for these multi-tiered temples is widely unknown in Nepal. See Korn 1976: 99.

[2] Further described in Gutschow 1982 and Donner 2010.

[3] The other monuments zones comprising the World Heritage are equally protected under national law (Jing, Forbes, Wijesuriya 2016: 16).

[4] For instance, there are more than 17,000 posts on Twitter with the hashtag #patandurbarsquare.

[5] Compare the climate data for Nepal available at Climatemps 2012-2015.

[6] Refer to chapter 4. Resources and Costs of Implementation.

[7] Refer to chapter 4. Resources and Costs of Implementation.

[8] See also: Government of Nepal National Planning Commission 2015: Executive Summary and Vol A.

[9] Compare Krist 2019.

[10] A complete list of projects can be found on the homepage of KVPT.

[11] See Paric 2018, Treml 2018 and Kaipf 2017.

[12] Lectures at the the IIC Nordic Group Conference in Iceland 2018 (Haselberger, Krist, Milchin 2019), at the Conference in Litomysl 2018 (Haselberger, Krist (forthcoming)), at the AIC/CAC Conference in Montreal 2016, at the Stone Congress in Glasgow 2016 (Krist, Haselberger, Milchin 2016), and forthcoming at the IIC Congress in Edinburgh 2020.

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RECOVERY AND RESTORATION OF THE TAISHUN WOODEN ARCH BRIDGES – WENZHONG BRIDGE, XUEZHAI BRIDGE, AND WENXING BRIDGE

Huang Zi

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1. The Heritage Resource and its Context Before the Impacting Event(s)

1.1 Description, Designation and Recognition

1.1.1 General Description

This case study describes the reconstruction of Wenxing Bridge, Wenzhong Bridge and Xuezhai Bridge, (figg. 1–3) three key component bridges of Taishun wooden arch bridges, which was declared a *Major Historical and Cultural Site Protected at the National Level* in 2006. Of these three bridges, Wenxing Bridge being one of 22 <<wooden arch bridges in Fujian and Zhejiang>> (fig. 4) was included in China's Tentative List of World Cultural Heritage in 2012.

All three covered bridges are located in Taishun County, Wenzhou City, Zhejiang Province of China. Taishun is a county in Wenzhou's mountainous area south of Zhejiang, surrounded by high mountains, dense forest and deep ravines. The area is characterised by warm weather, abundant water, torrential rivers and streams, dangerous shoals and gorges. There are traditional villages nearby the covered bridges. In history, a covered bridge was an important means of transportation for villagers living on either side of the bridge.

The heritage composition of the three wooden arch bridges includes the physical bridge and intangible heritage. The physical bridge consists of two parts: the bridge and its subsidiary part. The bridge consists of the abutment (pier), bridge body (wooden arches) and covered house; The subsidiary part includes the surrounding water system, barges, ancient roads, bridge houses, rural landscape, as well as inscriptions, plaques, niche for a statue of the Buddha and inscriptions on a stone tablet related to the wooden arch bridge. The intangible heritage includes bridge building customs, building techniques, building families and stories. The mountainous terrain itself underlies all aspects of this heritage. These bridges are mainly used as small ritual spaces.

▶

From top to bottom:
Fig. 1. Xuezhai Bridge
Fig. 2. Wenzhong Bridge
Fig. 3. Wenxing Bridge
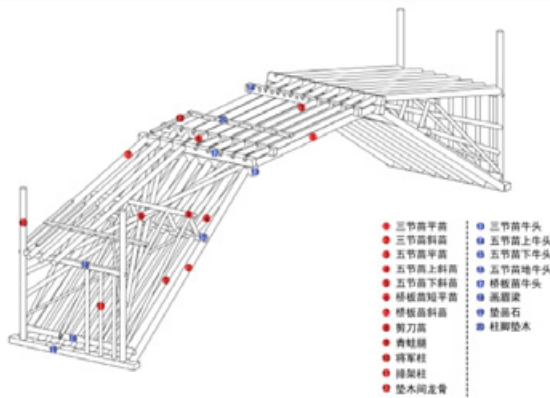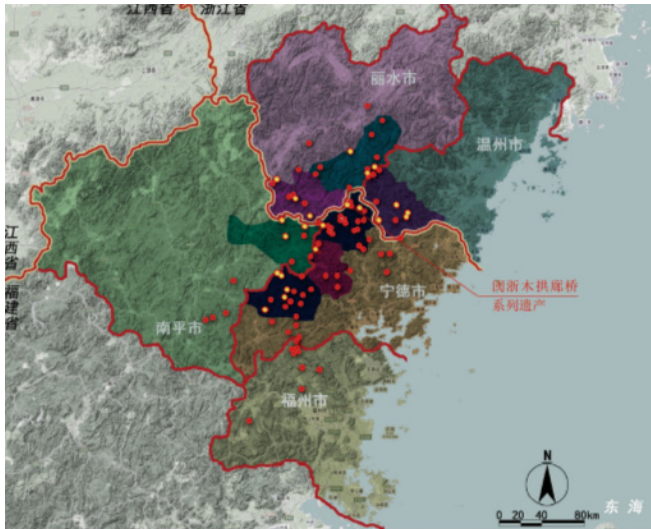
Images, Clockwise from top left:
Fig. 4. Location of 22 Wooden Arch Bridges in Fujian and Zhejiang
Fig. 5. Aerial photograph of Wenzhong Bridge
Fig. 6. Wenxing Bridge
Fig. 7. Bridge body

Numerous traditional villages are related to these three bridges. For example, on both sides of Wenzhong Bridge there are Chinese historical and cultural villages (fig. 5). These villages have a large number of traditional buildings, such as folk houses, ancestral halls, etc. Some of them have been designated as national, provincial, county or city heritage.

1.1.2 Form, Function, Creation and Subsequent Transformation

1) Wenxing Bridge

Built in 1857, Wenxing Bridge is a wooden arch bridge lying in a northwest-southeast direction. It has a total length of 40.2 metres and is 5 metres wide with a single span of 29.6 metres. It stands 11.5 metres above the

standing water level with twelve steps at the head of the bridge on the east side (fig. 6).

Abutment: Both sides of the bridge deck are chair-shaped and made of stone masonry.

Bridge body: The arch is erected by interlacing three-lines polygonal arc ribs, five-lines polygonal arch ribs and X-bracings, out of which, three-lines polygonal arch ribs have nine parallel members connected to tenons and mortises, five-lines polygonal arc ribs have eight parallel members (fig. 7).

Covered house: A total of seventeen bays, consisted of eighty columns. Each truss is a post-and-lintel structure composed of seven beams. On the side of the bay in

front of the covered house facing the river is a niche for a statue of the Buddha with: <<On September 13 in the Year of Ding Si (1857) of Xianfeng Reign of Qing Dynasty>> inscribed on the upper part of the truss. The vaulted three bays (Central Bay, Second Bay) form the gable and hip pavilion with double eaves (fig. 8).

Bridge house: Located at the north-western end of the bridge and was built to protect Wenxing Bridge (fig. 9).

Surroundings: Wenxing Bridge in located to the northwest of the town of Xiaocun; it spans the Yu Stream with Wentai Highway 200 metres to its east. Yu Stream is a tributary of the Feiyun River flowing into the Shanxi Reservoir (Feiyun Lake) to the north. On the two ends of the bridge, the ancient road at the mouth of the river and farmlands on its south side are well-preserved (fig. 10).

Images, Clockwise from top left:
Fig. 8. Covered house of Wenxing Bridge
Fig. 9. Bridge house
Fig. 10. Surroundings of Wenxing Bridge

2) Wenzhong Bridge

Wenzhong Bridge is a two-span bidirectional wooden beam covered bridge stretching from east to west like a long arm. The bridge is supported by a pier at the centre (fig. 11).

Abutment/pier: The abutment is built of rubble stone, the piers are of cut stone.

Bridge body: Built by interlacing long-arm beams, wooden flat beams and deck slabs 4 long arm beams for the first layer, 2 wooden flat beams for the second layer, 9 long arm beams for the third layer, 19 wooden flat beams for the fourth layer (fig. 12).

Covered house: This is 25.4 metres long, 4.17 metres wide, and has eleven bays built of forty-six columns. Each column-and-tie truss is composed of seven purlins and four posts. The three bays in the centre are raised to form an overhanging garble roof, while the bays on the two sides have a gable and hip roof (fig. 13).

Surroundings: Wenzhong Bridge is located in Taishun County, at the mouth of the river in Dongyang village of Xiaocun Town and spans Yu Stream. It has the same river system as the Wenxing Bridge. The two bridges are 2–3 kilometres apart. On the east side of Wenzhong Bridge there are mountains connected by ancient roads, paddy fields on its west side, and a backwater bay not far from the southeast where the Yu Stream flows through.
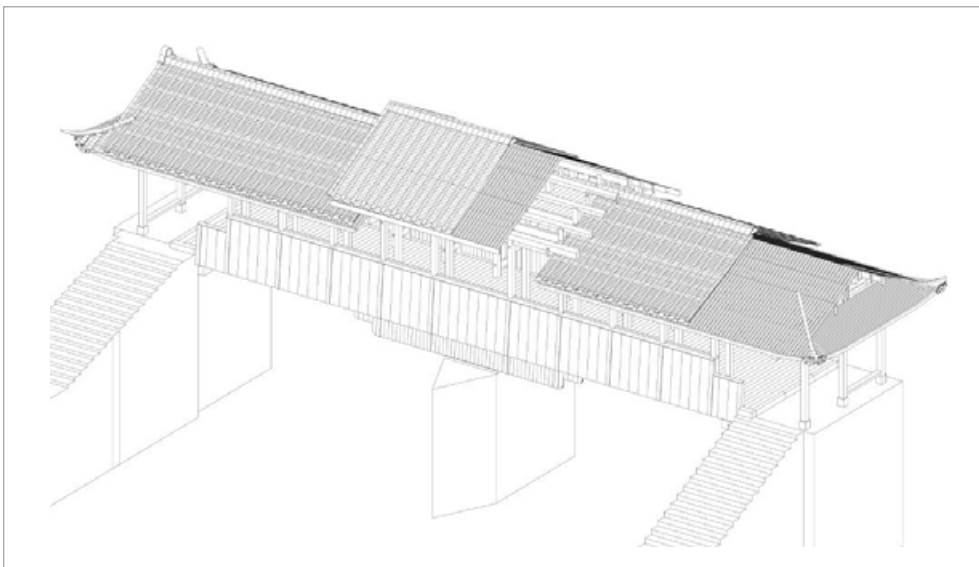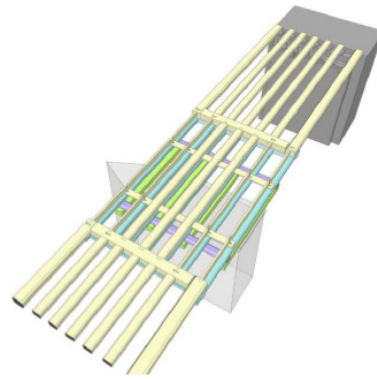
Images, Clockwise from top left:
Fig. 11. Wenzhong Bridge
Fig. 12. Bridge body of Wenzhong Bridge
Fig. 13. Covered houses of Wenzhong Bridge
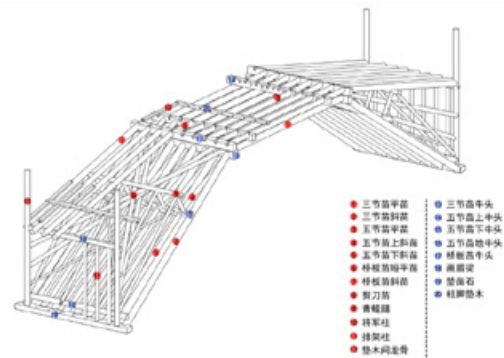
▲
Images, Clockwise from top left:
Fig. 15. 15 Xuezhai Bridge
Fig. 16. Bridge body of Xuezhai Bridge
Fig. 17. Surroundings of Xuezhai Bridge
Fig. 18. Niche for a statue of the Buddha of Wenxing Bridge

3) Xuezhai Bridge

Xuezhai Bridge is a wooden arch covered bridge lying in a southwest-northeast direction. It is 51 metres long and 5.1 metres wide. A single span is 28.12 metres long. The bridge stands 10.5 metres above the standing water level (fig. 15).

Abutment: The decking on both sides of the bridge is trapezoidal in form and built of stone masonry.

Bridge body: erected by interlacing three-lines polygonal arc ribs, five-lines polygonal arch ribs and X-bracings, out of which, three-lines polygonal arch ribs have nine parallel members connected to tenons and mortises, five-lines polygonal arc ribs have eight parallel members (fig. 16).

Covered house: 33.52 metres long, 4.98 metres wide, total fifteen bays built of sixty-four Columns. Each truss is composed of nine purlins and four posts. The central bay of 3.2 metres wide is used as the passageway. Bays on the two sides are 0.82 metres wide respectively, long wooden benches are provided for passers-by to sit and rest.

Surroundings: Xuezhai Bridge is located in the centre of the town, to the east and west of the bridge there are brick buildings. The relatively shabby landscape is a marked contrast to the historic environment of the bridge. The bridge was not originally built in the centre of the town but was gradually surrounded by new folk houses (fig. 17).

Purposes of the construction of the wooden arch bridges: Firstly, to facilitate transportation. Taishun area has many mountainous valleys and the bridges facilitate the traffic and communication of the surrounding villages to build bridges, not mainly for trade, but also as a resting place for passers-by. Secondly, for religious reason; the villagers set up shrines, worship gods and hold rituals in the porch houses.

Other purposes include geomancy and fengshui to satisfy the traditional setting that the villagers want to create, blessing for villagers to amass fortune, to remove ill fortune, blessing for villagers to give new birth, for clans and families to flourish. Another purpose is to provide a gathering site for villagers. Many folk customs and market activities are held at the covered bridges and nearby villages (fig. 18).

The bridge continues to be used for transportation, but its transportation function has been weakened with respect to the important rural tangible cultural heritage of Taishun area – newly formed traffic system in the vicinity, without affecting the wooden arch bridges.

1) *Material:* Local traditional building materials, mainly stone (such as rubble stones or blocked stones, for different positions)(fig. 19), wood (cedar wood, pine wood, old fir wood, black catalpa wood), tile (small hand-baked greyish green tile) and oyster shell powder (binding agent baked from shells), China wood oil.

2) *Building techniques:* Traditional construction technology of wooden arch bridges. For more details, see "List of Intangible Cultural Heritage in Need of Urgent Safeguarding – Traditional design and practices for building Chinese wooden arch bridges" (UNESCO 2009) or carpentry of Chinese wood-made technologies. The carpenter is a master woodworker with the skills to create a wooden arch bridge (fig. 20).

3) *Structural solutions*: Without any proven support of structural mechanics, craftworkers in ancient China invented wooden arch bridges based on their experience, using small, short wooden components connected by tenon and mortise joints which are essential in building a stable and scientific wooden arch bridge. This simple, yet, sophisticated structure solved the ancient transportation problem where columns could not be anchored to cross over wide rivers and mountain creeks, and the gap was thus filled by building long-span wooden structures in ancient China. Moreover, the bidirectional long-arm wooden flat beams made use of interwoven longitudinal and transverse wooden straight logs to increase the length of the main span so as to minimise the number of piers (fig. 21).

The bridges have been built and destroyed many times owing to natural disasters. The construction technology and materials are still available today, using local traditional materials and techniques of Taishun.
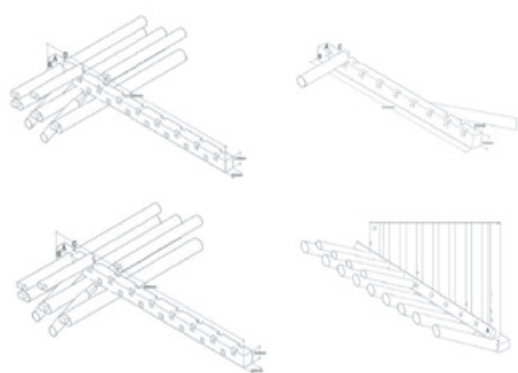
Images, Clockwise from top left:
Fig. 19. Stones for the construction of the bridge deck
Fig. 20. Carpenter guides the assembly of the beam frame
Fig. 21. Mortise and tenon joint
Fig. 22. Timber component

Fig. 23. Inheritors of intangible cultural heritage (from top to bottom: Wenxing Bridge: Zeng Jiakai, Wenzhong Bridge: Lai Yongbin, Xuezhai Bridge: Zhe Changgui).

Materials are basically sourced in Taishun. However, it might be difficult to source the original materials nowadays due to policies to protect the environment and forests. In Taishun, there is an inheritors group of intangible cultural heritage (fig. 23). The government respects the skills and knowledge of this group and provides opportunities for them to apply their expertise in protecting the bridges. Funds are also provided for their effort. The restoration of the three covered bridges is the result of cooperation between heritage teams and intangible heritage successors. The State, province and county extend funding depending on the circumstances.

The construction of the bridges needs to understand the traditional skills and techniques in building wooden arch bridges. These skills and techniques are still available, and in recent years particularly, there has been some demand for the construction of covered bridges. Currently, the carpenters are mainly distributed in the areas between Fujian Province and Zhejiang Province. They are only about fifty in number of which there are more than ten in Taishun.

From left to right:
Fig. 24. Certificate of inscription: The List of Intangible Cultural Heritage in Need of Urgent Safeguarding

1.1.3 Official Designation or Inscription

In 1991, the People's Government of Taishun County declared the three wooden bridges to be cultural relic units for protection at the county level. In 2006, the People's Government of Zheijiang Province declared nineteen wooden arch bridges as cultural relic units for protection within Zheijiang province. In 2006, the State Council declared the Taishun wooden arch bridges as National Heritage objects. There are fifteen wooden arch bridges so designated, among which Wenxing Bridge, Wenzhong Bride and Xuezhai Bridge are considered particularly important. In 2012, Wenxing bridge, one of twenty-two <<wooden arch covered bridges in Fujian and Zhejiang>> was included in China's Tentative List of World Cultural Heritage.

In 2009, the traditional design and practices for building Chinese wooden arch bridges was inscribed on the List of Intangible Cultural Heritage in Need of Urgent Safeguarding by UNESCO due to the challenges in the availability of skills and too few inheritors.

The designations apply exclusively to the heritage itself, although its surrounding environment is an important part of it.

UNESCO's remark on <<Intangible Cultural Heritage in Urgent Need of Safeguarding – Traditional design and practices for building Chinese wooden arch bridges>> is quoted below:

<<Wooden arch bridges are found in Fujian Province and Zhejiang Province, along China's south east coast. The traditional design and practices for building these bridges combine the use of wood, traditional architectural tools, craftsmanship, the core technologies of "beam-weaving" and mortise and tenon joints, and an experienced woodworker's understanding of different environments and the necessary structural mechanics....... As carriers of traditional craftsmanship, the arch bridges function as both communication tools and worship venues. They are important gathering places for local residents to exchange information, entertain, relax, worship and deepen relationships and cultural identity. The cultural space created by traditional Chinese arch bridges has provided an environment for encouraging communication, understanding and respect among human beings. The tradition has declined however in recent years due to rapid urbanization, change in transportation means and ways in exchanging information, all of which to combine to threaten its transmission and survival.>>

1.1.4.Scholarly Recognition

The following is abstracted from the Nomination Dossier for inscription of Wooden Arch Bridges in Fujian and Zhejiang on the China Tentative List of World Cultural Heritage.

The wooden arch covered bridges in Fujian and Zhejiang were built by craftworkers in ancient China based

on their experience without any proven support by structural mechanics. The ancient craftworkers used small, short wooden components connected to tenon and mortise joints which were essential in building a stable and scientific wooden arch bridge. This simple yet sophisticated structure solved the ancient transportation problem that a column cannot be anchored to cross over wide rivers and mountain creeks, filling the gap of building long-span wooden structure in ancient China. The bridges represented the creativity of Chinese people in ancient times.

The wooden arch covered bridges in Fujian and Zhejiang have similar wooden arch structures as the Rainbow Bridge drawn by Zhang Zeduan, an artist living in Northern Song Dynasty, in his famous painting *Riverside Scene at Qingming Festival*. All these bridges bear testimony to Chinese wooden arch bridges and reflect the advanced and sophisticated construction technology of wooden arch bridges in the Northern Song Dynasty.

Similarly, the numerous wooden arch covered bridges surviving in Fujian-Zhejiang mountainous areas are a special witness to the continuation and evolution of construction technology of Chinese wooden arch bridges.

1.1.5. Popular Recognition

The following is abstracted from the Nomination Dossier for inscription of Wooden Arch Bridges in Fujian and Zhejiang on the China Tentative List of World Cultural Heritage.

<<The wooden arch covered bridges in Fujian and Zhejiang are an exceptional example of the rural culture of remote hill villagers. In selecting the materials, and location for the bridges to building the bridges, it shows how mountain villagers in ancient China draw on local resources, adapt to local situation>>, how to comply with nature, fight against nature throughout a long period. The bridges are symbols and signs, representing the fengshui culture in Fujian-Zhejiang hilly areas that has lasted until today. They are public spaces in villages, a reflection of social structure, economic organisation and self-governance in ancient villages. Despite enormous pressure to protect these wooden arch bridges in Fujian and Zhejiang, their heritage value and symbolic significance cannot be ignored.

Being the *spiritual space* for villagers, the Fujian-Zhejiang wooden arch covered bridges carry the faith of mountain villagers to pray for blessing, to escape from harm. They are directly associated with the folk belief of mountain people that has lasted until today>>.

From building the wooden arch bridges to completion, the whole process is manifested in a series of cultural and folklore activities, e.g. choosing an auspicious date on which to start the construction, preparing the main beams, a ceremony to offer sacrifice to the rivers, selecting trees of suitable size, *cheers* for putting up the main beams, taking coins and rewarding workers, first step on the bridge, blessing of the main beam, final ceremony for completion and arranging a place for the shrine.

Fig. 25. Putting up the main beams

The bridge building practices are still continued today, mainly by the master carpenter through the pedigree of a clan.

1.2 History and Context

1.2.1 History, Ownership and Environment

1) Wenxing Bridge
First built in 1857 (7th year of Xianfeng Reign of the Qing Dynasty) by master carpenters Wang Guangyi, Wu Guangjie, Wu Wanchou, Wu Chengyi, Lin Ruizhi and Wu Shikuan. In 1930 (19th year of the Republic of China), villagers raised a total of 262 silver dollars to have the bridge rebuilt by master carpenters Wu Shengpin and Wu Zhengyi. In 1990, the bridge was rebuilt again after the allocation of RMB1000 by Taishun Museum together with the funds raised by Lin Shengying and villagers. In August 2010, Zhejiang Provincial Cultural Heritage Bureau allocated funds to overhaul the bridge. Damaged by Typhoon Meranti the bridge was swept away by a flood in September 2016 and reconstructed in December 2017.

2) Wenzhong Bridge
First built in 1745 (10th year of Qianlong Reign of the Qing Dynasty), destroyed and rebuilt many times, and rebuilt in 1921 (10th year of the Republic of China). Damaged by Typhoon Meranti the bridge was swept away by a flood in September 2016 and reconstructed in December 2017.

3) Xuezhai Bridge
First built in 1512 (7th year of Zhengde Reign of the Ming Dynasty), destroyed by floods and rebuilt many times until a bridge was built in 1856 (6th year of Xianfeng Reign of the Qing Dynasty). In 1986, the bridge was rebuilt using the 13,000 Yuan raised by Xue Jiamei and villagers, a subsidy of 13,000 Yuan from Zhejiang Provincial Cultural Heritage Administration and 1,000 Yuan from the Bureau of Transportation of Taishun County. Damaged by Typhoon Meranti the bridge was swept away by a flood in September 2016 and reconstructed in December 2017.

Ownership of the heritage resource: the bridges and roads are the property of the State and open to the public.

The land within the boundary of the bridges is owned by communities or individuals.

The bridges are located in villages or nearby. They are closely linked to the development of the villages. Due to modernisation, some of the traditional buildings have been converted to brick-and-concrete residential houses. The modern bridges, drainage system, dam and electricity stations around the covered bridges have created changes to the immediate setting of the heritage. There is a lack of infrastructure facilities and fire safety measures around the countryside.

The surroundings of the three bridges are very nice. Before the flood, the bridges were well-preserved. However, threatened by natural disasters, the bridge bodies pose certain vulnerabilities, mainly: 1) The bridge structure has limited tolerance to natural disasters, especially during super typhoons or massive flooding; 2) Natural ageing of the components greatly reduces the stability of the bridges, as a result, the bridges are more vulnerable to natural disasters; 3) The geographical environment around the covered bridges is easily infected by pests, causing the bridge components to corrode easily; 4) The covered bridges are not located in areas that are accessible from outside, therefore, it is difficult to obtain immediate support in case of a disaster.

1.2.2 Social and Economic Setting

1.2.2.1 Socioeconomic conditions of the area
Wenxing Bridge and Wenzhong Bridge are located in Xiaocun Town, a famous historical and cultural town and an ecological town of Zhejiang Province, located in the mid-northern region of Taishun County. Covering an area of around 80 square kilometres, the town has a population of 15,000. With an agricultural-based economy, Xiaocun Town is a famous tea plantation base in Taishun County. Industrial production in Xiaocun Town is small, mainly wooden toys, wood and stone processing. There are villages all around the two bridges.

Xuezhai Bridge is located in Sankui Town a commercial and transportation hub in central Taishun County, covering an area of 69.60 square kilometres with one residential district and sixteen administrative villages under its jurisdiction. Rich in tourism resources, the town's

economy is growing fast, fuelled by agriculture and aquaculture. The town centre is around the heritage site.

1.2.3 Frameworks, Agents and Communication

Conservation and Management Framework:

1) Law of the People's Republic of China on the Protection of Cultural Relics
2) Regulations for the Implementation of the Law of the People's Republic of China on the Protection of Cultural Relics
3) Regulations on the Conservation and Management of Cultural Heritage Sites in Zhejiang Province
4) Measures on the Conservation and Management of Cultural Heritage Sites in Wenzhou City
5) Measures on the Protection of Cultural Heritage in Taishun County
6) Principles of Conservation and Management of World Cultural Heritage
7) Regulations on the Protection of Famous Historical and Cultural Cities, Towns, Villages (applicable to Xiaocun Town)

Taishun wooden arch bridges are managed by Taishun County Office for the Protection and Management of Cultural Heritage (under the Bureau of Culture, Radio, Press and Publication of Taishun County), cultural workstation and part-time heritage preservationist in Xiaocun Town.

2. The Nature of the Impacting Event(s)

2.1 General Description

Typhoon Meranti occurred in 2016. The heavy rainfall of up to 300 mm in a very short period of time, caused the stream to surge. While this was a unique experience, the area is prone to flooding and has been subject to significant flooding in the past.

Taishun belongs to a subtropical monsoon climate zone featuring four distinct seasons, which can be hot, humid and have abundant precipitation. Taishun has an average of 2015 mm of rainfall. Annual precipitation is

unevenly distributed with 2 rainy seasons in a year. The first rainy season is in May–June which encourages the formation of mould. Thunderstorms, rainstorms or even torrential rain are frequent, accounting for 25.96 per cent of annual precipitation. The second rainy season in August–September, is known as the flood season, which is often accompanied by thunderstorms, heavy rainstorms and even extra heavy rainstorms, accounting for 26.54 per cent the annual precipitation. Because of its topography and climate, the formation of narrow river valleys, scattered tributaries, steep riverbeds, large river channels, precipitation, short and turbulent sources, rapid flooding and other characteristics, including typhoons are the main factors in the formation of regional flooding. This has resulted in a steep increase in water volume and a sharp rise in water levels.

2.2 General Impact of the Event(s)

Typhoon Meranti caused the Xuezhai Bridge, Wenzhong Bridge and Wenxing Bridge, to be washed away one after the other; other bridges were also affected to varying degrees. The typhoon had a big impact on the community. There were three deaths and two people went missing. Of a population of 163,000, 12,900 had to be relocated. Seventeen houses collapsed, and the area suffered direct economic losses of 896.35 million yuan. Tourism has suffered for the two years since the typhoon.

Abutments of the three covered bridges all had one side swept away, while the other side remained intact. The middle pier of Wenzhong Bridge was destroyed. The flood wiped out its bridge body and covered house. After emergency salvage, 30-60 per cent of the wooden components were recovered. Some of the recovered components were cracked or had missing parts, tenons broke off, the surface layer of wooden components split and rotted. Some components of covered house were missing, small carpentry, the niche for a statue of the Buddha, internal inscriptions are also missing.

The bridges have all been recovered. Craftworkers and woodworkers in Taishun restored the salvaged components as required. However, after recovery, the bridge body and the covered house of the bridges are not as stable as previously. The bridge deck and abutments were structurally strengthened during the restoration.

The surrounding environment is also vulnerable to floods. The barges to which it is connected are not reinforced or have been damaged at a later stage, Moreover, villagers' daily life and production also affect the bridges which makes conservation more difficult.

Work started on the bridges straight away and this has had a positive impact on the community and soothed the psyche of the local villagers.

2.3 Impact on the Significance and Values of the Resource

The disaster has not had a major impact on the authenticity of the heritage objects. Each bridge is restored in place according to the shape and original carpentry, using salvaged members and restoring the members to the original specifications.

2.4 Emergency Repair(s) to Date

Right after the typhoon, the Bureau of Culture, Radio, Press and Publication of Taishun County made an Emergency Announcement on "Collecting Wooden Components of Destroyed Covered Bridges". Villagers living along the rivers set out immediately to rescue the wooden components of covered bridges wiped out by the flood. All rescued components were placed in a temporary shelter and treated with anti-corrosion agents or corrosion-inhibition agents. The original components of covered bridges that were salvaged were repaired by the carpenters (inheritors of intangible cultural heritage) immediately; this emergency protection measure opened up the possibility of reconstructing the bridges later.

2.5 Documentation and Narratives

2.5.1 Documentation
Everything was documented using videos, photos, texts, including people who rescued the bridges from the flood, number of salvaged components, donations. All emergency documentation has been shared with the relevant key agents and stakeholders.

2.5.2 Narratives
The bridges have been restored and the people around

them have been involved to further deepen its imprint on them. The floods caused rapid and violent rises in water flow, resulting in the destruction of the bridge deck or piers, causing the entire bridge to be swept out. The bridge decks and abutments have been repaired and structurally reinforced, and the heritage resource is in a safe condition, the arches and covered houses are not as integrated as before because of the use of damaged and repaired components.

3. Post–Event Appraisals

3.1 Impact Assessment

The villagers communicated verbally with the local heritage authorities on the restoration programme. Part of the bridge deck was damaged and the location was clear, the file was complete, salvage components accounted for a large proportion, the local bridge skills heritage and other factors then determined the "Taishun Wooden Arch Bridge-Wenxing Bridge repair project design", "Taishun Wooden Arch Bridge-Wenzhong Bridge repair project design", "Taishun Wooden Arch Bridge-Xuezhai Bridge repair project design". In these programmes, the destroyed bridge deck is restored and strengthened, and the bridge bodies and covered houses are repaired according to the original form. The preparation process was timely and effective in communicating with expert leadership and local heritage departments.

Three well-known local inheritors of intangible cultural heritage and traditional craftsmen who are masters of the traditional design and practices for building wooden arch bridges worked together to restore the three bridges, using traditional construction skills and techniques. Different stages of bridge building have different ceremonies such as earth moving, logging, etc., and the niche of the bridge is mainly for blessing and peace.

The first priority is to ensure the integrity of the covered bridges, next is their immediate surroundings. Control through delineation of protected areas and construction control.

3.2 Post-Event Documentation

The recovery process has been documented by Ji Haibo, director of Taishun County Intangible Cultural Heritage Centre. He used photographs to document the restoration process, special components, and the skills of the inheritors of intangible cultural heritage.

The documentation is kept in Taishun County Office for the Protection and Management of Cultural Heritage, the head of the Institute is responsible for keeping them; all parties, including the people who live around the bridges, are aware of the existence of archival records: Historic photos, drawings, "Four documentation", 3D scanning data for Xuezhai Bridge, Wenxing Bridge.

3.3 Challenges for Recovery

Technology: Too many salvaged wooden components make it difficult to find out where they were originally located. The inheritors of intangible cultural heritage, cultural and technical personnel and local carpenters have identified pieces many times. Moreover, these wooden components have been severely damaged. The percentage of original components is 40-70 per cent; damage is repaired through pier joint, patching, patching and other ways.

Social dimension: There is a high level of social concern and an urgent desire for reconstruction.

Decision-making: There is some controversy over whether the destroyed bridge is still an artefact after it has been repaired. One party believes that the bridge is no longer in existence after it has been destroyed, while the other party believes that the location is clear, most of the components remain, and technology is passed on.

3.4 Responses and Recovery Programme

The programme for the restoration project was completed in October 2016, the preliminary formalities were completed in six months, the restoration process and restoration plan were developed, and the restoration work was completed on schedule at the end of 2017.

The recovery programme was prepared by Zhejiang Design Institute of Ancient Architecture, implemented by the Bureau of Culture, Broadcasting, Tourism and Sports of Taishun County (Taishun Bureau of Cultural Heritage). The community, which had a "basic" understanding of the recovery of heritage resources, was kept informed of progress at all stages

Purposes:
Recover the three bridges to their pre-damaged forms (form, structure, workmanship, materials), and recover the authenticity and integrity of the heritage.

Guiding principles:
Use original components, original materials, original skills and techniques as much as possible. Recover the original fabric of abutments and piers to ensure their authenticity. Recover immediate setting of the bridges, traditional design and practices, folk customs to ensure their integrity. Employ appropriate technologies to reinforce the bridge structure. Combine recovery with intangible heritage for passing on the tradition to future generations. There are also involvements of professional technicians, managers, heritage companies, inheritors of intangible cultural heritage.

Fig. 26. Ji Haibo documenting the restoration process

The programme of restoration and non-restoration was fully discussed, and experts in heritage conservation were organised to conduct expert examinations, and the decision was finally made by the State and provincial antiquities bureaus, which decided to carry out *in-situ* restoration of the three bridges and restore them to their original state.

Some studies on the recovered bridges have not yet been completed, e.g. the report on the recovery of covered bridges after the typhoon is still under preparation. Documenting the entire process of restoration and conducting in-depth research are still ongoing.

3.5 Values and Sustainability

The general environment in which the bridges are located is important, and it is clear that the bridge deck and piers are the weak part of the bridge. At that time, the bridge decks and abutments were washed away first, causing the entire bridge to be washed away.

The financial, human and social costs of the recovery programme and future management/maintenance of the recovered bridges have been effectively addressed. The Taishun government and villagers are concerned about sustainability, whether economic, social or environmental. They take initiatives to protect the bridges.

3.6 Drivers, Agents and Governance

The main drivers for recovery were the government's decision-making support; the close involvement of all parts of society; the active participation and support of local villagers, etc., to actively promote the concept of cultural relics, policies, and unify thinking.

Financial support and social donations also played an important role in the restoration of the heritage. Funds were raised through the internet, television and radio, etc., and with a dedicated door-to-door collection.

While ensuring the stability of the bridges, the recovery is required to use original components whenever possible. Priorities and requirements are identified and assessed by the Design Institution according to national laws and regulations. The purposes are to retain the

historical information of the bridges as much as possible, to recover the original structure and style of covered bridges, and to meet the authenticity and integrity of the heritage.

Local communities/stakeholders were not involved in drafting the recovery/restoration programme. The local villagers wanted to restore the bridge as soon as possible to a brand new look and assessed their expectations on the technical aspects of the need and feasibility of restoration.

All levels (State/Province/City) of cultural heritage departments played an important role in decision-making and approval of the recovery programme. Funds were provided by numerous associations. Taishun Intangible Heritage Centre and Design Institution provided technical support.

Building contractors did not play a role in the recovery programme, however, inheritors of intangible cultural heritage (carpenters who are skilled in building traditional wooden arch bridges) were involved in the design of the overall wooden components of the unit, from the arrangement, identification and repair of wooden components, and the positioning of the components, to the overall restoration of the bridge.

As part of the post-event governance framework there are pre-plans for different situations. In particular, there are measures in place for flooding. Following the typhoon, Taishun County established a special leadership group to manage the situation at local and national level. Instructions flow along the chain of command from Bureau of Culture, Radio, Press and Publication of Taishun County, to Taishun County Office for the Protection and Management of Cultural Heritage.

4. Documenting Response Actions, Timeframes, Resources and Costs

4.1 Actual Implementation and Timescales for the Recovery Programme

During the 8-month implementation phase from March to December 2017, abutments and piers were rebuilt

before the flood season in June. The next phase was to recover the upper parts of the bridges.

Recovery began as the floodwaters receded. Taishun government and local villagers set out immediately to salvage the wooden components. Officials of all levels rushed to the site to give clear instructions and unify the effort. The Design Institution (the most famous cultural heritage conservation research institute in Zhejiang Province, responsible for cultural heritage restoration, heritage declaration) also came to the site immediately to conduct surveys despite tedious procedures (such as establishment of projects, approval of programmes at different levels, multiple validations, etc.) and scarcity of information. The recovery programme was established soon after the project was submitted for approval. Due to the efforts of all parties, the recovery programme was approved very quickly. After completion of the drawings and plans, tenders were immediately issued to invite three contractors, who worked with intangible heritage successors in Taishun, to recover the covered bridges. The three contractors were: Hangzhou Heritage Construction Company Limited, Shaoxing Ancient Architecture and Garden Landscaping Company Limited, and Yongjia Nanxijiang Construction Company Limited. All three companies are qualified to work on cultural relics. Wood and tiles were procured locally to replace those wiped out by the flood. The construction of the bridge deck and piers could not proceed during the flood season, so time was very tight. The wooden structure part of the repair was more difficult; in order to speed up progress, repair of the wooden arch was carried out simultaneously. It was planned to complete the repair works within 8 months, with the aim of completing the recovery before December 2017.

Intangible heritage successors demonstrated the traditional design and practices for building wooden arch covered bridges. Thus, the reinforcement method of the members of the bridges is generated. Some values and attributes could not be recovered, however, since some of the physical components of the covered bridges wiped out by the flood were gone forever. Those that were salvaged were often damaged beyond repair. The historic inscriptions inside the bridges were also lost. (These bridges are not periodically washed out; they are also 100 years old and restoration

maximises the preservation of authenticity in accordance with heritage principles)

4.2 Resources and Costs of Implementation

The Design Institution and Construction unit jointly used equipment to test the stress waves and note the resistance of the salvaged wooden components. Geological and water reconnaissance were conducted by Zhejiang 7th Reconnaissance Team and Zhejiang Design Institute of Water and Electricity Reconnaissance respectively.

The construction unit worked with craftsmen who are experienced in building wooden arch covered bridges using construction technology. They recovered the damaged covered bridges using traditional design and practices.

The Design Institution and Construction unit used scientific structural reinforcement measures, with the three bridges retaining between 60 and 80 per cent of their members, and there were discussions about whether to repair or replace them, as the members had varying degrees of damage. The damaged members have been repaired by pier jointing, patching, ticking, etc.

The Bureau of Culture, Radio, Press and Publication of Taishun County, the Design Institution, Construction unit and local villagers were actively involved in the recovery of the covered bridges. Local villagers dictated information about the bridge to specialists, provided their own opinions on the repair programme, and supervised the bridge repair process. The local government set up a dedicated leadership group to oversee the recovery programme. All of the above parties had experienced technical staff to collaborate on this. The materials were basically sourced locally, especially pine (horsetail pine) and willow fir, which are important components of the bridge. Due to the large size of the materials used for the bridge, the history of the bridge is generally taken from local materials due to traffic problems, and the length, strength, etc. meet the requirements.

All levels of government supported the recovery of the covered bridges and took costs into account in the planning, including the donations in money and kind from villagers, about a third of the total.

All parties tracked each phase of the recovery programme and the technical services during the entire implementation phase. Where technical problems arose, these were resolved on site. Among them, the design unit was the core force in the repair process.

5. Documenting the Outcomes and Effects

5.1 Assessment of the Outcomes with Regard to the Recovery of the Heritage Resource

According to the original form and structure, a large number of original components have been adopted and inheritance techniques have been adopted to restore the form and style of the heritage before the disaster. The authenticity and integrity of cultural relics have been guaranteed. The inner spiritual home of the local villagers was restored.

The actions have been very effective. All levels of government departments and all sectors of society recognise the recovery. ICOMOS China named the recovery of Taishun Covered Bridges as a <<National Distinguished Conservation Site>>, leading to a wave of <<conserve the heritage, inherit the heritage>> among the public, igniting a passion of <<love our bridges, protect our bridges>> among local villagers.

Planned sustainability objectives have been achieved. The wooden arch bridge technique has been inherited, and the wooden arch bridge reappears above the stream.

There have been no conflicting views about the project. It is considered a successful restoration project, with the participation of everyone in resolving contradictions in the restoration process.

The integrity, original shape and style of the physical bridges and immediate setting have been recovered. The intangible elements of the bridges (construction technology of wooden arch covered bridges) have also been employed and inherited during the recovery process. Those that could not be recovered are components swept away by the flood and damaged components losing load-carrying capability, including Buddha niches and inscriptions. The space for the niche was restored, but the statue was not, which gradually weakened the influence on the villagers' lives.

The significance of the three covered bridges continues to be acknowledged. The surrounding villagers are more familiar with the heritage than before. The bridges have become part of their daily lives again. For local villages, the recovery of the bridges arouses a sense of belonging and identity deep inside their heart. Now, they pay more attention to culture, bringing new life to local culture, tourism and economic development.

The guidance of government departments (communicate effectively with different groups to determine the direction of restoration), full engagement from the villagers (*Love bridge, bridge, a lot of enthusiasm*), technical aspect backed up by professional teams (one of the best teams in the country) and inheritance of intangible skills and techniques, together with the efforts of all parties, all played an important role in the entire process of recovering the covered bridges damaged by the flood.

We will further strengthen protection, strengthen preventive monitoring and improve management. As an important participant in the scheme system, the proposal of the wooden arch bridge will attract great attention from the local community mainly from the perspective of how to protect it.

5.2 Ownership of the Results

The Bureau of Culture, Broadcasting, Tourism and Sports of Taishun County (Taishun Bureau of Cultural Heritage) owns the result of the recovery programme. The local people have a strong sense of ownership, and the bridge is a part of their life, they also actively cooperated with the director of cultural relics to do a good job on the restoration.

There is a shift in value perception in the post-recovery phase. In the heart of local villagers, a covered bridge is not simply a bridge in front of their home, but a covered bridge of Outstanding Universal Value. Villagers,

intangible heritage successors all understand that heritage rules and requirements must be followed to recover the covered bridges. Components cannot be replaced as one wishes.

5.3 Documenting the Recovery Programme

5.3.1 Main documentation needed:

1) Taishun Covered Bridges – Approval for Recovery of 10 damaged bridges including Wenxing Bridge (Heritage Conservation [2016] No. 1915)

2) Zhejiang Provincial Cultural Heritage Administration – Approval of the Programme for Recovery of National Heritage: Xuezhai Bridge, Wenxing Bridge and Wenzhong Bridge (Zhejiang Cultural Heritage [2017] No. 29)

3) Minutes of Meeting for Assessment of the Programme for Recovery of National Heritage: Xuezhai Bridge, Wenxing Bridge and Wenzhong Bridge (February 2017)

4) Taishun Covered Bridges – Programme for Recovery of Wenxing Bridge and construction drawings

5) Taishun Covered Bridges – Programme for Recovery of Wenzhong Bridge and construction drawings

6) Taishun Covered Bridges – Programme for Recovery of Xuezhai Bridge and construction drawings

Other documentation can be obtained from Taishun County Office for the Protection and Management of Cultural Heritage.

The recovery process has been documented. Both written and electronic records on acceptance test and supervision are available from contractors.

"Taishun wooden arch Bridges – Report on Recovery of Wenzhong Bridge", "Taishun wooden arch Bridges – Report on Recovery of Xuezhai Bridge, Wenxing Bridge" (Published in 2020 as planned).

New information was produced during the recovery phase. Xuezhai Bridge and Wenzhong Bridge had never been overhauled since being rebuilt over a century ago. The recovery this time identified the tenon and mortise works and structures hidden inside. This information is not yet public as it is still in the internal discussion phase. Engineering reports will be published and made available to the public.

The documentation accurately records in detail the entire process of recovering the covered bridges damaged by the flood, including the traditional construction technology and underlying data of the three covered bridges. The documentation provides key information for future actions to improve the level of effectiveness.
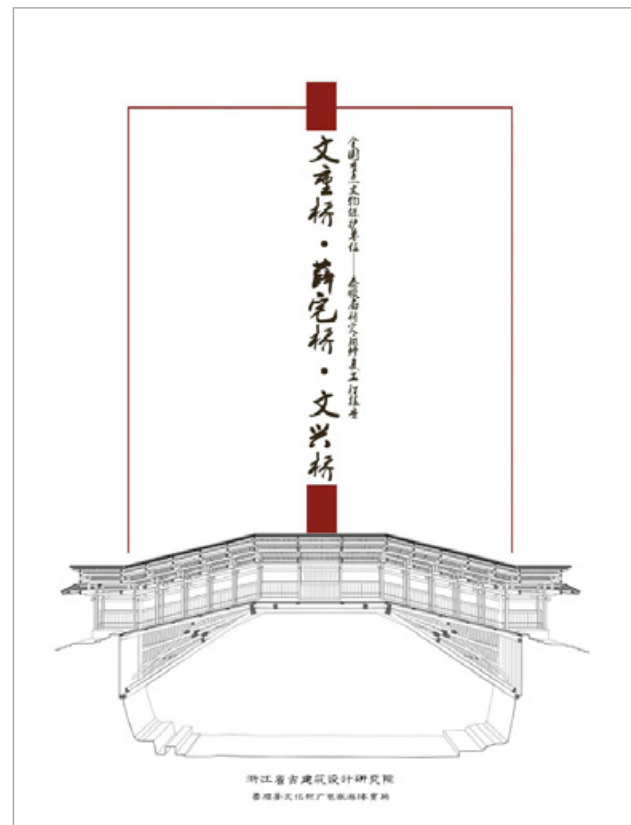
▶
Fig. 27. Cover of the engineering report on the recovery of the three wooden arch bridges

6. Details of the Expert(s) Completing this Case Study

Huang Zi, a certified architect (Grade II), is the Director of Zhejiang Design Institute of Ancient Architecture, a part-time researcher in Zhejiang University, a tutor to master's degree students, member of ICOMOS/China, Vice Chairman of China Association of Cultural Heritage Conservation Technology and Director of the Academic Committee for Traditional Construction Technology of Wooden Architecture in State Administration of Cultural Heritage Research Hub. He has been involved in the study of heritage preservation since 1980.

In that time Huang Zi has undertaken a number of projects:

- National projects in China (Aid to Tibet, Disaster Relief and Rehabilitation of Sichuan, Three Gorges Heritage Conservation);
- Overseas projects ("The China Temple" in Nepal, "Thousand Trees Villa", a Chinese Classical Garden in Los Angeles, USA);
- Aid projects to foreign countries (Ta Keo Temole in Cambodia);
- Conservation projects for National Heritage (Feiying Pagoda in Huzhou, Shisi Temple in Jingning She Automonous Region, Haishen Temple in Haining City, Loyal King Mansion in Suzhou, Yanfu Temple in Zhejiang Wuyi County, Yanqing Pagoda in Zhejiang Songyang County);
- Large recovery projects (Ancient architectural Complex in Ningbo Cicheng, Temple of King Qian in Hangzhou, Gongchen Bridge Historical Streets, Zhongshan East Road in Hangzhou);
- World Heritage Nomination projects (Hangzhou West Lake, China Grand Canal, Archaeological Ruins of Liangzhu City);
- National "13th Fifth Year" project ("Scientific Study of Traditional Construction Technology of Ancient Architecture" (2012-2014));
- Specification for heritage conservation documentation, budget standard for conservation of heritage architecture.

On 17 September 2016, after the Taishun Wooden Arch Bridges – Wenzhong Bridge, Xuezhai Bridge, and Wenxing Bridge were swept away by the flood, Huang Zi rushed to the site to instruct local people on how to protect the wooden components and follow-up actions. During the preparation of the recovery programme, Huang Zi was the person in charge of final details. He set out recovery principles, technological path, and provided guidelines for designers to resolve technical problems. During the implementation phase, Huang Zi helped technical staff address technical issues. In the compilation of final reports, he finalised the report framework and offered numerous suggestions.

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THE INTERPRETATIVE RECONSTRUCTION OF THE ROYAL CAPITAL IN NYANZA, RWANDA

Re-assembling Heritage Fragments for Post-Genocide Recovery

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1.1 Description, Designation and Recognition

1.1.1. Description

In the royal tradition of Rwandan kings that went from the fourteenth to the twentieth centuries, the Royal Capital, which consisted of the residence where the kings lived with their extended families, service and court, was a temporary settlement composed of several huts made of perishable materials (fig. 1a). Every king would have itinerant capitals whose locations were designated by *abiiru*, the king's advisors, keepers of royal secrets, clairvoyants, and magicians. They were in charge of performing the rituals to select the hills where the residence of the king would be established.

The Royal Capital in Nyanza was the last established by King Yuhi V Musinga (1896-1931) in 1899, and the last capital built following the traditional architectural and belief system of pre-colonial Rwanda. Furthermore, this was one of the few royal capitals experienced by Europeans:[2] The settlement has been described by travellers, functionaries and missionaries that lived and worked in Rwanda during the German[3] and Belgian[4] occupations. Based on these accounts, French historian

Bernard Lugan, described in his article "Nyanza, une capitale royale du Rwanda ancien" [Nyanza, a Royal Capital of Ancient Rwanda] (Lugan 1980), the organisation of the Royal Capital in Nyanza. It is based on Lugan's interpretation, that the reconstruction of the Royal Capital was projected in the aftermath of the Genocide against the Tutsi which occurred in 1994 (hereafter referred to as the Genocide). So far, only an ensemble of three huts has been reconstructed in Rukari hill, (fig. 2) a neighbouring hill to the one of Nyanza, also in Nyanza district, in the Southern Province of Rwanda, between 2003 and 2008.

Descriptions from Coupez and Kamanzi (Coupez and Kamanzi 1962) and cited by Lugan assert that the Royal Capital was composed of multiple enclosures that would form, in their view, a sort of labyrinth. The main house where the king lived and received his guests was called *Kambere,* and the second important house was called *Rugend.* (fig. 1b). A hut was also reserved for the royal drum *Karinga*, and other dynastic drums. One other hut was used for conserving the sacred fire from the mythical King Gihanga, from which all the kings would descend. Other huts were dedicated to the souls of former kings and one enclosure would belong to the dynastic bull *Rusanga* and its cows *Insanga*, descendants of those living in the reign of King Gihanga.

Images, Clockwise from top left:
Fig. 1a. Example of temporary royal settlement
Fig. 1b. King Musinga at his palace
Fig. 2. Ensemble of reconstructed huts in Rukari hill

From left to right:
Fig. 3. Part of the former home of Hubert Ngenzi, which was dismantled and reassembled in the Museum of Rwanda
Fig. 4. Two trees mark the enclosure of the former Royal residence

The enclosure of the king was connected to the public square called *Akarubanda* (literally meaning, <<from the people>>). Surrounding this enclosure, there were several houses and temporary huts for guests and servants.

Urugo in Kinyarwanda is the word for house. The circular layout of the *Urugo rw' Ibwami* (house of the king) was the model for all houses, which reflects the traditional way that huts were constructed in different regions and different social classes. The largest and most elaborated were those from kings and secondly, those from chiefs. The residence of King Musinga consisted of sixteen huts inside the main enclosure, but the settlement counted 34 in total (Kanimba Misago and Van Pee 2008: 20).

Professor Célestin Kanimba Misago, archaeologist and former director of the Institute of National Museums of Rwanda (INMR) and Lode Van Pee, Belgian architect, published a book entitled *Rwanda Traditional dwelling* in 2008 where they described the process of building a traditional hut, based on their research on Rwandan vernacular architecture. Professor Kanimba Misago was in charge of the reconstruction of the Royal Capital, and in this book, he described the royal huts reconstructed in Rukari hill. The design of these royal huts is based on another traditional hut, which in 1955, was part of the home of Mr Hubert Ngenzi. Mr Ngenzi was the second in chief, *igisonga*, of Rwamiko, today in Nyaruguru district, Southern Province of Rwanda. The hut was the second in importance for a lavish compound. In 1957, the hut was dismantled and rebuilt in the Musée

du pays du Rwanda (Museum of Rwanda).[5] Certain elements of the roof were therefore cut off so that the hut could be brought into the museum building. However, the dome of the roof, *inkoko y'igisenge,* was left intact. Some pillars and the thatch roof cover were replaced, and all these materials were used to re-install the hut at the Ethnographic Museum in 1989 (fig. 3).

The assumption was that all huts follow the same construction techniques and basic design, would become more complex and more decorated when the hut belongs to a person of higher hierarchy and with more resources. One element that differentiated the king's hut from others were the two antennas on top of the entrance (fig. 1b). Kanimba Misago and Van Pee (2008) explained that in Rwanda, the traditional dwelling was composed of two basic units, the hut and the compound which were both of a circular layout. The hut was totally or partially enclosed by the walled compound that defined an entrance courtyard in front of the residential hut. The entrance to both the hut and the enclosure were aligned so it was possible to see from the hut directly to the enclosure entrance. The royal residence enclosure is thought to have been approximately 200 metres long, and between 80 metres and 140 metres wide, made of reed woven with rush and euphorbia. Its entrance was framed by two sacred trees, one ficus and one red-hot poker tree (*erythrina abyssinica*) for protection and planted when the site was chosen. These two trees are the markers of the emplacement of the royal residence that lasted after all the structures vanished into nature (fig. 4).

According to Kanimba Misago and Van Pee (Ibid.), the most important element of the structure of a traditional hut was the ceiling called *Ipfundo,* (fig. 5) the size of which determined the size of the building. The reconstruction of the royal huts in Rukari followed the same process: The central part is woven with basket patterns. This central part is surrounded by four woven rings representing the universe. The first one represents Heaven or the world where *Imana* (God) lives called *Ijuru*. The second represents the world of celestial bodies and is called *Ikirere*. The third one represents the world of people and is called *Isi*. The fourth represents the world of death and is called *Ikuzimu*. After these symbolic rings, the ceiling was woven circularly by binding together stems of shrubs (*desmodium mauritianum*). The name of this circular woven structure was *Imbabaza*, and it was done following a technique called *ubuhuruture* (Ibid.: 26–32). Depending on the wealth of families, they would develop more elaborated roofs, mats, larger huts and with more units of huts and enclosures. The techniques for weaving the different elements of the huts are still conserved but the most elaborated are only known by some surviving masters.

A crosspiece called *urubaruro rwa koma* is the junction between the roof and the lower part of the hut. This piece had magical functions for protecting the hut from bad luck and bad spells. The assembling of the prefabricated woven ceiling and the lower part of the house was called *kwakira inzu* (to receive the house) and was performed following special rituals. After this, the pillars were installed inside the hut and this action was called *guterura inkingi*. The pillars support the ceiling and have a diamond-shaped capitel that links the wooden pillar with the ceiling (fig. 6). Finally, the roof was covered with thatch made of plants such as *urukangaga* (*miscanthus sp.*), *umukenke* (*hyparrhenia sp.*) or *ishinge* (*eragrostis blepharoglumis*). The thatching began at the bottom of the hut and finished at the top, and after it was completed, ceremonies used to be performed to inaugurate the house.

The traditional huts were designed for protecting and taking advantage from the environmental conditions. Without any other opening besides the entrance, the hut maintained itself fresh inside during the day and warmer at night. They used to have a central hearth for giving light inside the hut, reducing the humidity and warming up the space (fig. 7). The smoke would go out through the entrance. This smoke was useful for keeping mosquitoes and other insects away from the interior of the huts.
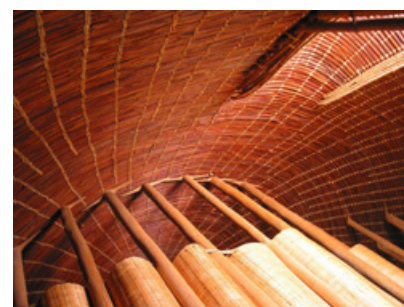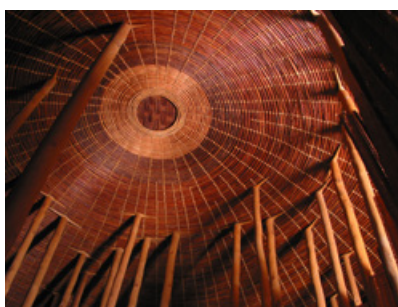
▶
**Images, Clockwise
from top left:**
Fig. 5. Ceiling *(Ipfundo)* of a traditional hut
Fig. 6. Diamond-shaped capitels linking the wooden pillars to the ceiling of the Hubert Ngenzi hut in the Museum of Rwanda
Fig. 7. Typical hearth in the centre of the Hubert Ngenzi hut in the Museum of Rwanda

Kanimba Misago and Van Pee (Ibid.) also described the process for building the traditional huts. The first step was the choice of the site for the construction called *ikibanza*. This process required, as in the case of a Royal Capital, the intervention of soothsayers who would recommend the best place that would not present danger for the future occupants of the house or they would perform a ceremony to banish any bad luck for the future occupants. The second step was the gathering of the materials for construction and preparation of the site. The materials used were tree trunks or branches for the pillars, which before the introduction of eucalyptus were selected according to the region: *umusave* (*markhami platycalyx*), *umubilizi* (*vernonia amygdalina*), and *umuvumu* (*ficus sp.*). The cross-pieces or *imbariro* were made with flexible branches such as *umuseke* (a kind of fine reed *phragmites mauritianus*), *urubingo* (a kind of ordinary reed *pennisetum purpureum*), *imbabaza* (shrubs of *desmodium mauritanum*), *umusororo* (shrubs of *indigofera erecta*), *umunaba, umutilitili, umucundura* (shrubs of *waltheria indica*), *umukindo* (palm tree *pheonix reclinata*) and *igishurushuru* (fern *pteridium aqualium*). The plants used for thatching and ropes were *umukenke* (*hyparrhenia filipendula* family), *uruguhu* (*eragrostis olivacea*) or *ishinge* (*blepharoglumis* family), plants from the marshes *urukangaga* (*cyperius latifolius*), or *amasaka* (*sorghum bicolor* used by poorer families). The plants that served for producing ropes by stripping and twisting were *umuhotora* (papyrus bark), *imigozi y'umuvumu* (ficus bark), *ibirere* (banana tree bark), *umugozi w'umuka* (blackwater bark *acacia de curens*), named also *barakatsi*. Finally, the construction was carried out in several steps of which the main ones were: laying out the site *gusiza ikibanza*, drawing a circular line that would be the circumference of the house called *umugero*, and weaving the ceiling, *kuboha igisenge*, which was the start of the construction.

The different parts of the traditional hut, which are reproduced in the reconstructed royal huts, are named as follows in Kinyarwanda:[6]

- Inside the hut:

  - inkomanizo z'umuryango: the uprights surrounding the house's entrance; their role is to ensure privacy by preventing indiscreet glances from outside;

  - imfuruka ebyiri: two corners, in the northern and southern sides of the house, where visitors were received;
  - umugendo: the space for walking between the hearth, urubumbiro, and the wall opposite the bed;
  - uruhimbi: shelf for milk pots, located along the wall opposite the bed in the umugendo;
  - ikirambi: the central part of the house where the head of the family and his close friends would sit during evening gatherings;
  - urubumbiro: a circular hearth made of clay used as a fireplace and for decoration;
  - ku rwuririro: entrance for the bed towards ikirambi;
  - uburiri: bed, a place for sleeping;
  - ivure: the side of the bed that is close to the wall of the house;
  - ku kagege: a kind of table or dresser located at the head of the bed where utensils were placed;
  - mu mirambizo: space at the foot of the bed.

- Outside the hut:

  - irebe ry'umuryango: the entrance to the vestibule or porch;
  - igitabo cy'inkomane: the threshold made of clay which was constructed under the entrance canopy in order to stop the rain from flowing into the house;
  - uruhamo rw'umuryango: the vestibule or porch of the house;
  - igitabo cya nyirantarengwa: the entrance of the house;
  - igitabo by'inzu: external projections of the wall on each side of the house's entrance;
  - agasongero: a pointed wooden stick protruding from the centre top of the house and serving as a fixation point for the thatch;
  - amashyoro: two pointed sticks protruding above the thatching on either side of the porch roof.

Tree trunks were used as pillars inside the house and had specific names according to their location:

- inkingi ya kanagazi: pillar placed in the centre of the entrance and supporting the roof covering the entrance to the hut;
- inkingi ya mbonabihita: the first pillar in semi-circular

line of pillars supporting the partitions ending near the head of the bed and closing off the central area of the hut;

– inkingi y'akageege: a partition pillar located at the head of the bed and used as support for that partition;

– inkingi y'amacumu: a pillar for spears located on the left side of the entrance to the bed and from which rings were tied to keep the spears standing upright;

– inkingi y'imbere: the first pillar supporting a semi-circular partition (to the left of the central area) that ended at the foot of the bed;

– inkingi y'indamurano: a partition pillar located at the foot of the bed and used as support for that partition;

– inkingi y'isoni: discretion pillar, located on the right side of the entrance to the bed;

– inkingi y'iziko: hearth pillar, the four pillars which surrounded the hearth.

The traditional huts of the Royal Capital described in Lugan's account and which it is planned to reconstruct are the following sixteen: (fig. 8)

1. Hut I: Close to the central entrance of the residence, it was the largest hut, called *Kambere* and dedicated to the Mwami (King) Kigeri IV Rwabugiri (1853–1895), father of Musinga. This hut was between 14 metres and 16 metres in diameter and 7 metres high. It had an *Igitabo*, which was an entrance made of clay and which was 30 cm. high and semi-circular; it protected the entrance to the hut from water and humidity. A small hut dedicated to the *Inzu*, the lineage ancestor, was used for rituals where the descendants gathered and gave offerings to calm their ancestor's spirit.
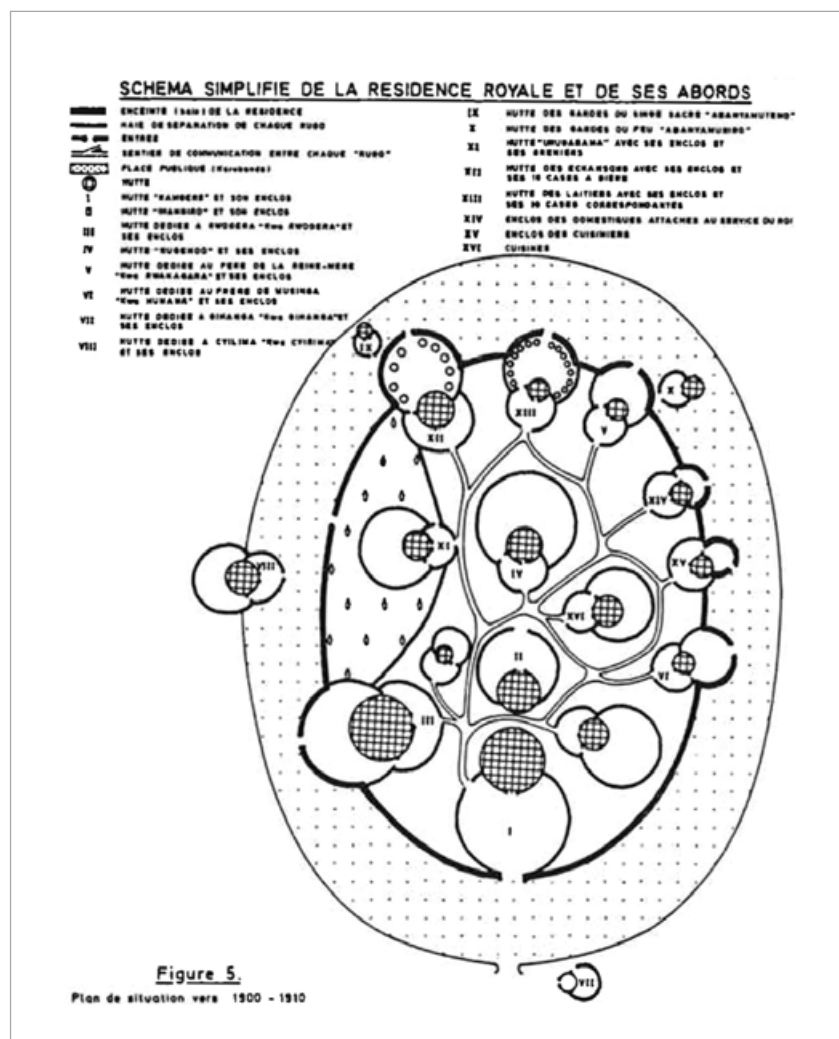

Fig. 8. Plan for the proposed reconstruction of the Royal Capital as described in Lugan's account

2. Hut II: This hut was built behind the hut called *Kambere*, and it was called *Ihangiro,* which was where the king lived. It was smaller than *Kambere* and did not have a backyard.

3. Hut III: It was dedicated to Mutura II Rwogera, former King (1830–1853) and was located to the left of the *Kambere*. It was where the royal guards stayed.

4. Hut IV: This hut was called *Rugendo* and was for the use of the king. The traditional layout was composed of one hut which accessed two courtyards.

5. Hut V: This hut was for the *Rwakagara*, the father of the Queen Mother Nyirayuhi Kanjogera, mother of Yuhi V Musinga. It had double access, over the residence and to the public square.

6. Hut VI: Belonged to the brother of Musinga, Munana, and it was similar to Hut V.

7. Hut VII: It was located outside of the residence, and it conserved the sacred fire *umuriro wa Gihanga*, from the mythical founder of the royal lineage.

8. Hut VIII: This hut was dedicated to Cyrima II Rujugira and it was located outside the residence, next to the public square. It hosted *Karinga* and the other dynastic drums. Other huts dedicated to other ancestors of the royal lineage were located around this area, but their exact location is not clear.

9. Hut IX: This was the hut of the guardians of the sacred monkey*,* and it was located outside of the residence.

10. Hut X: This was the hut for the guardians of the fire *abanyamuriro,* and it was located outside of the residence.

11. Hut XI: Called *Urugarama*, it was located inside the residence, but open to the exterior. It had access to the public square and the residence. This is where all the royalties paid in the form of food and supplies from every region of the kingdom and paying tribute were stored.

12. Hut XII: The hut for the beer service, accompanied by ten smaller huts where the different categories of beer were stored.

13. Hut XIII: The hut for the milk service, accompanied by thirty smaller huts to store the milk.

14. Hut XIV: The enclosure for the servants.

15. Hut XV: The hut for the cooks.

16. Hut XVI: The kitchen.

Besides these sixteen huts, the king's wives lived in adjacent hills, and not in the residence, so there was also a special hut for the gatherings between the royal spouses and the Queen Mother, who was the decision-maker according to the established royal system.[7] There were other huts for other servants, such as smiths, builders of the royal enclosure, farmers of the court fields, ficus tailors among others. The royal cattle used to wander and graze in the neighbouring hills.

According to the tradition, the royal capitals were itinerant and would change from place to place several times a year. Once abandoned, they could not be occupied by another king, and they became sacred places. Even though, most of the material would perish naturally, the sacred trees protecting the entrance would remain as symbols and natural monuments of the location of the capital.

The first and only Royal Capital to become permanent was Nyanza. The Germans and, later the Belgians, also established political bases to maintain relations with the king in the area. Traditionally, there were maintenance works on the royal huts because all materials were vulnerable to atmospheric conditions and decay (branches, wooden pillars, clay, cow dung, etc.). As shown by some photographs of the beginning of the twentieth-century, women were in charge of maintaining clay, dung and painting elements in the *Igitabo* (fig. 9). However, during the Belgian colonisation, it is said that <<the decline of royal power was reflected in the deterioration of the royal premises in Nyanza. The king lost a big fraction of his material wealth and was unable to refurbish his residence.>> (NURC 2016: 243-4).

In 1931, King Musinga was deposed by the Belgian colonial rule, and the place of the Royal Capital in Nyanza was abandoned. The process of deterioration of the royal huts and other structures has not been recorded. In 1935, the Catholic mission of the White Fathers was established in Nyanza. Subsequently, the church, currently called King Christ Catholic Church, where Rwanda was consecrated to Christianity in 1946 by Musinga's successor, Charles Rudahigwa (Mutara III Rudahigwa) and the*,* today, *Groupe Scolaire Mater Dei*, were built in the area where the Royal Capital used to stand (figg. 10, 12). Hence, before the Genocide occurred, the traces of the Royal Capital had already been covered, leaving behind only two mementos of its presence: a *ficus* tree and a well (fig. 11).

Images, Clockwise from top left:
Fig. 9. Women maintaining the clay, dung and paint elements in the *Igitabo*
Fig. 10. King Christ Catholic Church situated in the area where the Royal Capital used to stand
Fig. 11. Ficus tree and well – all that remain of the former Royal Capital
Fig. 12. *École Ménagère*

1.1.2. Designation

The authors postulate that royal capitals represent a traditional system of inhabitation distinctive to Rwandans which formed a unique, ephemeral and continuously regenerating cultural landscape. The strategy used for identifying the location, selecting the materials and developing the construction system responds to the specific conditions and characteristics of the mountainous landscape of Rwanda's geography and its people's beliefs, knowledge system, and socio-political organisation. Rwandans appropriated a challenging geographical space that showed constraints for both settling and carrying out agro-pastoral and forestry activities for survival and growth.

Even though royal capitals have not been designated officially as cultural landscapes nor valued as cultural landscapes, the authors aim to show the importance of the reconstruction of the Royal Capital of Musinga in Nyanza as a starting point to recover heritage values of the Rwandan cultural landscape. The authors suggest that royal capitals reflect the Rwandan worldview and a characteristic settlement design.[8] Thus, the reconstruction of the Royal Capital in Nyanza consisted of the interpretation of available heritage fragments and the use of cultural memory for rebuilding national identity, recovering values and giving significance to a society hurt by a traumatic event such as the Genocide.

Even though the Royal Capital represents only an ensemble of architectural elements of what used to be the cultural landscape in pre-colonial Rwanda, it is a central organisational element, and represents a core for Rwandan society, as the king was seen as a God-like leader.

Because the materials in which the royal capitals and in general, huts were constructed were perishable, there was not an acknowledged system for conserving historical buildings or sites before the German colonisation of Rwanda. The first protected areas were national parks created during Belgian rule with the Volcanoes National Park, first gazetted in 1925, to protect the mountain gorillas from poachers. This area was part of the first national park established in Africa, the Albert National Park (now Virunga National Park), when both the Democratic Republic of Congo and Rwanda were Belgian colonies. The *Institut des Parcs Nationaux du Congo Belge* (Institute of National Parks of the Belgian Congo) was founded in 1934, and Akagera National Park established. Currently, there are two more national parks in Rwanda: the Nyungwe Forest National Park,[9] established in 2004 and the Gishwati Mukura National Park, established in 2015. All these natural protected areas have been inhabited traditionally by indigenous peoples, hunter-gatherers, some of them containing sacred forests, and being the source of materials used for the construction of royal capitals and other ritual elements, such as drums.

Later, in 1955, the *Institut de la Recherche Scientifique en Afrique Centrale* (IRSAC – Institute of Scientific Research in Central Africa) was created. Then, the Department of Social Sciences based in Huye[10] started collecting materials and artefacts from Rwanda, Burundi and Eastern Congo. These collections of objects followed an ethnographic approach, characteristic of European colonisers and scientists of the time (anthropologists, ethno-ecologists, botanists). The collection and studies were focused on movable artefacts, including plants and their uses. With the exception of the above-mentioned traditional hut brought to the IRSAC in 1955 from Nyaruguru district (which happened to be movable), there was no focus on immovable heritage. However, these artefacts were not studied or conserved as cultural heritage but as ethnographic objects, following the museographic/collection approach, and not following

a holistic heritage conservation approach, that would also consider establishing a legal protection for the places where these were found. There was no typology or categorisation of places or sites that needed to be conserved, such as the royal capitals or other pre-colonial and vernacular architectural constructions. Their value was not recognised, and it is only recently that a law has been passed to protect cultural heritage including movable and immovable, as well as intangible cultural heritage. This first ever law to protect heritage sites in Rwanda came into force in 2016 – Law no. 28/2016 of 22/7/2016 (Ministry of Culture of Rwanda 2016). Yet, an inventory of the cultural heritage of Rwanda is still in process (Institute of National Museums of Rwanda 2017), and further elaboration of categories and models of protection for heritage places and resources are projected.

1.1.3. Recognition

Added to the lack of identification of and protection to cultural heritage and heritage places, the history of Rwanda during the twentieth-century has been one of conflicts and political instability that culminated with the Genocide. Along with waves of migration (1956–1962, 1973 and 1990–1994) caused by civil conflict, the cultural landscape has undergone important changes: abandonment of land and property, restructuring and modernisation of the agricultural system, focus on the cultivation of cash crops (e.g. coffee), soil erosion, villagisation and urbanisation (Ford 1990). But the heritage value has not been acknowledged and therefore, neither the whole nor elements of the cultural landscape have been protected. The recognition of the values of the Royal Capital as an architectural ensemble representing a symbol of Rwandan identity only came after the Genocide and through the recovery process. Yet, the remains of the Royal Capital of King Musinga have not been excavated and the only material evidence of the location of the ancient capital are the above-mentioned sacred tree and well, kept inside the school occupying the area where the Royal Capital is thought to have been standing. The source of this information is oral tradition and testimonies of Nyanza elders. Other evidence, besides the travellers' narratives and functionaries' accounts, include photographs of the beginning of last century. Due to the lack of resources and due to the occupation of the hill by the church facilities and the subsequent urbanisation

process, a further exploration for scientific evidence of the Royal Capital has not yet been undertaken.

For local communities, the royal capitals or royal residences are the one typology that remain significant across the country (Institute of National Museums of Rwanda 2017). Still, their ephemeral existence and immaterial evidence based only on oral history make their designation and official recognition challenging. Furthermore, the lack of resources has not allowed for an in-depth search of material evidence in the location as recalled by elders and in traditional oral narratives. The case of the Royal Capital in Nyanza is one among other royal capitals and chief residences, but it is the most documented case. This particular situation raises an essential question for heritage conservation, since it is not clear what are the heritage resources that should be conserved, and how to delimit an area for protection. In some cases, testimonies assert that a royal or a chief residence was established in what presently is an agricultural field. Therefore, ownership issues also arise, and in order to clearly designate and recognise these areas, further archaeological research is required.

1.2 History and Context

1.2.1. History

According to historians (National Unity and Reconciliation Commission 2016), the Kingdom of Rwanda started from a nucleus in the Gasabo hill, located in the present district of Gasabo in Kigali city, the current capital of Rwanda, along the valley of Lake Muhazi (Map 1). It is important to note that the history of Rwanda, as a kingdom, is based on oral history which is composed of several categories of narratives, which are fluid and interrelate without a strict chronological order that can speak of a linear history. An absolute history of the events that took place in the territory of what is now modern Rwanda, has been attempted by scholars such as Jan Vansina, J. K. Rennie, and they are based on contrasting sources from Alexis Kagame, a Rwandan priest and scholar descendant from the *abiiru*, with oral narratives from elders (Kagame 1959, Rennie 1972, Vansina 1962). What is widely accepted is that the first king ruling the Kingdom of Rwanda was King Ruganzu I Bwimba,[11] who belonged to the *Abanyiginya* clan.
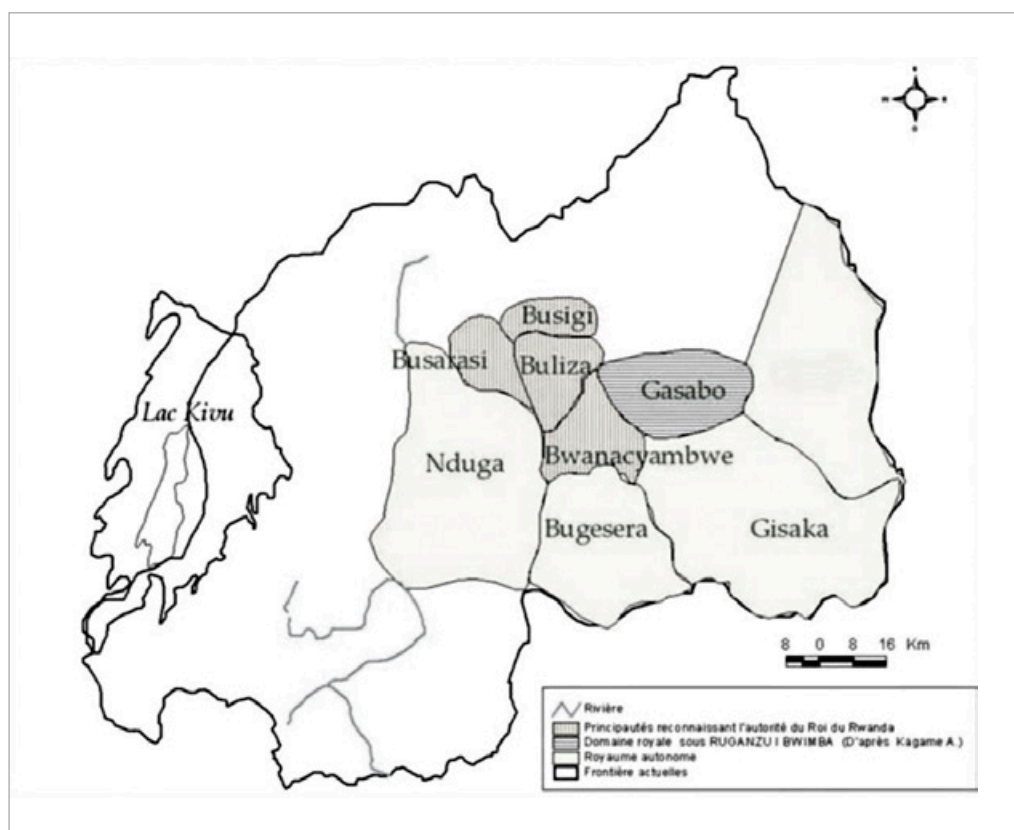
Map. 1. Map showing the Lake Muhazi valley

This marked the beginning of the Nyinginya dynasty rule in the fourteenth-century, which continued until the European colonisers occupied Rwanda, and is mostly accepted as the beginning of the history of the Kingdom of Rwanda. Much of modern Rwanda follows cultural, social and political traditions that find their roots in the Nyinginya dynasty rule (Giblin *et al.* 2011).

In the tradition, each king would build several capitals during their mandate. One example is King Kigeli IV Rwabugili (1853–1895) who built at least 31 capitals (Kagame 1975:17–19). During his reign, which lasted from 1896 to 1931, Yuhi V Musinga, son of King Kigeli IV, and the one who was in power when the German colonisers arrived in the Great Lakes region, occupied several royal capitals: Rwamiko, Runda, Kamonyi, Gitwiko, Bweramvura and Mwima, before he installed himself in the hill of Nyanza in 1899 (Ibid.).

The Royal Capital in Nyanza was one of the residences of Yuhi V Musinga, who followed the tradition of his lineage, started by Ruganzu I Bwimba (1312–1345) in Gasabo hill at approximately the beginning of the fourteenth-century. Even though the history of the Rwandan Kingdom is not precise due to the absence of written sources before the nineteenth-century, the location of former capitals is retained in the memory of the elders and through its intergenerational transmission. Nevertheless, it is possible to precisely locate the last capital of Musinga because of the written testimonies from the missionaries and travellers from the end of the nineteenth-century and the beginning of the twentieth-century. Moreover, the capital was set permanently there by Musinga after the colonisers arrived and surviving elders had also witnessed its location.

Bernard Lugan (1980) explains that, traditionally, in order to select the location of a Royal Capital, the *abiiru* of the court would take small amounts of earth from the prospected hill, and they would mix these with the king's saliva and cow milk; this mixture would then be given to a bull that would be later sacrificed and opened. If the reading of the animal's entrails was favourable, they were buried with the animal's remains where a sacred tree (*ficus*) was planted. In the times of the kingdom, it was believed that the king was God, and the term *Imana* (meaning God in Kinyarwanda) refers to the Creator, to the essence of life and the fertility of land and humans (National Unity and Reconciliation Commission 2016: 99). The objects used for making predictions were conserved as material proof of *Imana nziza*, or positive fate.

After the deposition of Musinga in 1931, a palace was built by the Belgians for the son of Musinga, Mutara III Rudahigwa, who was declared his successor, in the neighbouring hill of Rukari, bringing the tradition of the royal capitals to an end (fig. 12).

During the Belgian colonisation, the system of occupation and organisation, built up by the Rwandans for several centuries, was progressively eroded. The creation of *paysannats* started changing the cultural landscape and formed rural concentrated villages in the valleys and close to the transportation routes,[12] moving the population from the hills to the lower land. In rural areas, the population otherwise spread in the hills, would then be forced to settle in planned villages: the first *paysannat* was established at Gakoma in 1953, then in Muhero in 1954, both in the Southern Province of Rwanda (Umugwaneza 2003). However, this relocation was not fully successful, and people continued to inhabit the hills with their traditional systems of occupation, management and utilisation of resources, such as forests, meadows and agricultural land.

After Grégoire Kayibanda came to power in 1962 with the independence of Rwanda from the Kingdom of Belgium, the palace of King Rudahigwa in Rukari hill was abandoned in 1964. At this time, the name of Nyanza was changed to Nyabisindu, so the history of the kingdom would be forgotten. Finally, the Genocide represented the total destruction of the cultural landscape, since rural settlements were practically eliminated by the perpetrators in order to take possession of the land of the victims (Bigagaza, Abong & Mukarubuga 2002, Guichaoua 2005).

1.2.2 Context
The territory of Rwanda is divided into five provinces: Kigali, Northern, Southern, Eastern and Western. The country is commonly called "the land of a thousand hills", and this metaphor is reflected in the hilly landscape of terraces omnipresent in the land-locked country of 26,338 km². Except for the plains of Akagera, where the Akagera

Fig. 13. "Land of a thousand hills"

National Park is located, in the Eastern Province in the border with Tanzania, Rwanda's geography is populated by hills (fig. 13). Behind the *land of a thousand hills* slogan lies a historical strategy to inhabit this complex geography where hills represented a unit of land for organising the territory and its population.

In the hills of what is now the district of Nyanza, several kings established: <<(...) the Bami *(Kings)* of the eighteenth and nineteenth centuries settled in this country *(Nyanza)* rich in its population of farmers and its numerous herds of cattle. The woods that remain in many places mark the location of the residences of Bami Mazimpaka, Rujugira, Ndabarasa, Gahindiro, Rwogera, etc.>> (Anonymous 1956: 54). The most important hills were Rwesero, Nyanza, Rukari and Mwima[13] where the father of King Musinga, King Kigeli IV Rwabugili lived, close to Mushirarungu hill. In the time of the Royal Capital in Nyanza, the hills of Mugonzi, Gatsinsino, Gakenyeri, Mwima, Rwesero, Kavumu, Gihisi, and Nyamagana were also populated by traditional huts (Kanimba Misago and Van Pee 2008: 21). This image tells how people traditionally lived in Rwanda, spread huts among terraces and plantations located on the slopes of hills, and not in the valleys that were used for agriculture or grazing. As explained by Kanimba Misago and Van Pee

(Ibid.), the residences of Rwandans were established on the top of the hills, or in the gentle slopes, as the marshes and forests <<were considered inhospitable because of mosquitoes>> (Ibid.: 12) and were used for other activities such as hunting, farming and pasture.

The population used to be settled in specific hills according to their lineage which belonged to a specific clan. Each lineage (*umuryango*) would occupy several hills and each extended family would occupy one hill. And each hill would have a chief of army, a chief of cattle and a chief of agriculture. As stated by the historians commissioned to write the History of Rwanda by the National Unity and Reconciliation Commission: <<Reforms of traditional administration started in 1926 with the abolition of the system of three chiefs. This had a profound impact on social relations>>. (NURC 2016: 250).

Meschi describes how the hill system was still working for a lineage of mainly farmers in the 1970s (Meschi 1974). She mentions in a note that: <<Rwanda is a mountainous country; the multiple hills constitute natural habitat and exploitation units. Rwandans used the term *umusozi* "la colline" for designating the place where they live and they own land>>[14] (Ibid.: 39).

The name of the property of one lineage in Kinyarwanda, the national language, is *umugogo* refers to the action of clearing up the land (Jacob 1984: 377). Meschi described how that land was the property of a lineage and was acquired by the founder of the lineage, the first one to inhabit the hill that defined a space for himself and for his descendants. She explained in this way, the real estate system going back for several generations and showed how the population growth and the system of inheritance had a big impact on social and economic relations of the Rwandan population at the time she did her research.

This particular system of occupation directly related to the geographical conditions is reflected in the architecture and nature of royal capitals. As seen in the photographic archives of the INMR, and the exhibitions in the Kandt House Museum of Natural History, the

Ethnographic Museum in Huye and the King's Palace in Rukari, the Royal Capital of King Musinga was located on the top of the hill, in a plain (fig. 14) large enough so that a settlement could be established. The hill commonly known as Nyanza is surrounded by several other hills that are visually connected and where King Musinga's successor established his residence after him: Rwesero, Rukari, and Mwima. In Rukari, the palace of King Mutara III Rudahigwa, successor and son of King Musinga, was erected by the Belgians, following a European architectural style (fig. 15). This location developed into the King's Palace Museum, and next to it, the reconstruction of the Royal Capital was started. In Rwesero, the building of what was planned to be his new palace is still standing (formerly, the National Art Gallery, currently to be re-inaugurated as the Home Grown Solutions Museum in 2020 fig. 16). Rudahigwa could

Images, Clockwise from top left:
Fig. 14. Royal settlements were typically located on the top of a hill overlooking such plains
Fig. 15. Palace of King Mutara III Rudahigwa
Fig. 16. Home Grown Solutions Museum (formerly the National Art Gallery)

Fig. 17. Mausoleum where Rudahigwa and Kigeri V Ndahindurwa, his brother and the Queen Rosalie Gicanda are buried, in Mwima

never dwell in this building because he passed away before its completion. The mausoleum where Rudahigwa and Kigeri V Ndahindurwa, his brother and the Queen Rosalie Gicanda are buried (fig. 17) is located in Mwima.

2. The Nature of the Impacting Event

In 1994, the Genocide against the Tutsi was the dramatic event that ended the civil war which had unfolded in Rwanda in 1990. After Juvénal Habyarimana's plane, then president of Rwanda, was shot down in the evening of 6 April 1994, the killings began. In 100 days, from 7 April to 4 July, 1,074,056 people lost their lives,[15] and towns and villages were ravaged. Especially in the rural areas and the remote hills, property was shattered. This conflict was based on ethnic distinctions between Tutsi and Hutu that some scholars and functionaries (National Unity and Reconciliation Commission 2016) claimed did not exist until the establishment of Rwanda as a Belgian colony at the beginning of the twentieth-century. Other theories point at a fluid socioeconomic system operating during the times of the kingdom, where the different groups were not distinguished as ethnic, but socioeconomic,

sometimes rooted in clan distinctions, by which members of one could become members of the other and vice versa (Saur 2014). Nevertheless, this distinction was used during the colonial rule to separate the population and create a permanent environment of distrust.

The destruction of the cultural landscape of Rwanda had been already underway, since colonisation. Three main stages have been identified: the Belgian colonial rule (1916–1961) with the dismantling of the traditional land organisation and governance system, reinforced by the establishment of *paysannats* (reflected on the abandonment of the Royal Capital and occupation of Nyanza hill by the Church), the Republican government and the continuation of the restructuring of rural Rwanda (continuation of the *paysannats* policy and industrialisation of agriculture), and finally the Genocide, when the rural settlements in the hills were completely destroyed (total destruction of the hill system including traditional huts, cattle and agricultural land).

The Genocide looked at not only the elimination of Tutsi and moderate Hutu in the whole country, but also, at destroying their property and overtaking their land.

From the tradition, pastoralists that were associated with Tutsi and former rulers of the kingdom, occupied large extensions of lands where they used to feed their cattle. The farming way of life, associated with the Hutu majority tended to use small plots of land, and as time passed by, there were smaller plots for larger families which needed to be divided and inherited, creating land pressure, as explained by Meschi (1974). Thus, the idea of a pastoralist landscape and its related cultural practices were perceived as opposed to the agricultural landscape and its related cultural practices, even though, agricultural and pastoral were complementary traditions, and ecologically also linked to forestry, which relates to the cultural practices of hunter-gatherers (i.e. Twa people). However, the ethnic differences enforced during the colonial rule have been reflected in the land use and the perception over the landscape as pastoral distinct from agricultural. This conceptual cultural division between pastoralists and farmers emphasised at the same time the ethnic distinctions and contributed to polarisation in a context of increasing land scarcity (Bigagaza *et al.* 2002). For instance, during the rule of President Kayibanda (1962–1973) and President Habyarimana (1973–1994), the farming culture was promoted, and modernisation of agriculture was a political and economic priority that was also encouraged by international cooperation projects (Ibid.).

As a result, the destruction of the cultural landscape during the Genocide also consisted of destroying family properties and eliminating all members of entire families so that there would be no descendants that could claim back the land.

The Royal Capital in Nyanza was already covered by the Catholic Church during the Genocide, however, the traditional way of life that the Royal Capital represented, and that was mostly surviving in the rural areas of Rwanda, was destroyed at this time. The Royal Capital and the life of the Rwandan Kingdom represented to the perpetrators, an epoch of subordination to the minority that they were trying to eliminate. The symbol of the kingdom represented by the memories and images of the Royal Capital and the royal court endured. Perpetrators were focused on destroying lives and private property, which included any remains of constructions, whether traditional or not. Heritage resources were neglected and people carrying the traditional knowledge were killed.

The destabilisation of Rwanda based on the destruction of culture, cultural heritage, traditional leaders, traditional institutions, traditional organisation – which were founded on a local evolution and constituted a particular cultural landscape – that started with colonisation was almost achieved during the Genocide.

In the aftermath of the Genocide, the government initiated a *villagisation* strategy, called *Imidugudu* (figs. 18a-b) to redistribute the scarce land to people returning to Rwanda after exile and as a more effective land management policy, since one of the main challenges has been to distribute land equally to the growing population (Hilhorts and Leuween 2009, Ministry of Infrastructure, Republic of Rwanda 2009). In parallel, the government undertook a campaign in 2011 to eradicate the traditional thatched roofs (commonly referred to in a derogatory manner as

◄
From left to right:
Fig. 18a. Re-distributing scarce land to cater for people returning from exile and for the growing population is a continuing challenge
Fig. 18b. The campaign for housing: among its aims is to replace traditional thatch with corrugated iron or tiles

Nyakatsi) to be replaced by corrugated iron or tiles, wishing to develop modern housing for all Rwandans (Ministry of Infrastructure, Republic of Rwanda 2015). These strategies that originated as a way to boost the economy, recovered hygienic conditions and improved social ties in the population, had the unexpected effect of overlooking the value of heritage and the importance of traditions, local knowledge and the cultural landscape, and its potential for recovery and reconstruction, in social, environmental, and economical aspects.

3. Post-Event Appraisals

After the Genocide, there was much confusion and shock in Rwandan society. The crisis continued for several years. It has been a process of recovery in all aspects, although heritage sites were not a priority at the beginning. As there was no law that would protect cultural heritage at the time, many potential historical sites were destroyed, as were testimonies of vernacular architecture in the settlements of rural areas that were still occupied in traditional ways until the Genocide.

Several assessments have been carried out by the Government of Rwanda, by international donors, and by international agencies; these have mostly focused on the economic impacts of the war and Genocide and the psychological impacts on the population. The United Nations commissioned an independent report in order to establish the role of the organisation and its agencies during the Genocide (Carlsson *et al.* 1999). In the aftermath of the Genocide, besides focusing on finding justice, with the establishment of the International Criminal Tribunal for Rwanda in November 1994 by the United Nations Security Council (Resolution 955),[16] the government searched for the economic reconstruction of Rwanda looking for a stability that would enable reconciliation.

The National Unity and Reconciliation Commission was created in 1999 as the institution responsible for supporting the building of a united country, changing the governance regime based on discrimination and exclusion. In 2001, the new government released "Vision 2020",[17] a strategy for the recovery of Rwanda

which would focus on economic development, with an emphasis on decentralisation and the development of rural areas, so that further conflicts would be prevented. A new constitution was adopted in 2003.

Because the Royal Capital as such no longer existed there has not been further assessment of its loss. The cultural landscape, characterised by the traditional huts on the hills, suffered damage during and after the Genocide. Yet, no assessment of damages from a cultural heritage perspective has been undertaken, due to the lack of identification, designation and recognition. As explained above, the villagisation projects, developed in the rural areas as a way to reconstruct the society, hinder the regeneration of traditional land occupation and organisation. The 2011 ban on thatched roofs impeded the regeneration of traditional architecture. These recovery measures have resulted in the erosion of traditional knowledge and intergenerational transmission of traditional techniques.

Since the main source for disunion was perceived to have been introduced during the colonial rules with artificial ideas of division, the conclusion of the new government's assessments was that going back to pre-colonial ideas of *Rwandanness* were necessary. In order to look for unity and heal the wounds and scars from almost half a century of conflict, Rwandans needed to remember and embrace their pre-colonial past. To aid this, <<home grown approaches>>[18] have been promoted. The Kinyarwanda language and traditional practices used by all Rwandans were the first elements of the cultural heritage that were promoted and used for the recovery process; this included *Gacaca* courts[19] for restorative justice and *Umuganda,* a support system for general cleaning, tree planting, road works, building houses for vulnerable groups, construction of schools, health centres, organised by communities in neighbourhoods. These traditional practices have been instrumental for recovery and reconstruction, although, as some scholars point out, these have been <<re-invented>> or adapted to the new circumstances and political agendas (see Ingelaere, 2008 on the *Gacaca* courts; Uwimbabazi and Lawrence, 2013 on *Umuganda*). Nevertheless, these researchers also find that both *Gacaca* and *Umuganda* are closer to the hearts of Rwandans than other foreign approaches to justice or reconciliation.

It was in this context that the value of the Royal Capital in Nyanza as a symbol of *Rwandanness* was recalled. Even so, documentation regarding the decision to reconstruct the Royal Capital is missing as well as an assessment that would justify the selection of this particular heritage site, which was at the time only kept in the memory of the elders and the archive photographs of colonial missions.

Currently, the institution in charge of the identification, protection, management and conservation of cultural heritage is the Institute of National Museums of Rwanda (INMR), whose history starts with the Ethnographic Museum in Huye in 1989. After the Genocide and in the process of recovery, the INMR constituted itself as a network of museums from 2004, under the mandate of the Ministry of Sports and Culture. The reconstruction process has been re-traced through investigating the INMR archives and requesting information from the staff working at the time that the reconstruction project was carried out.

4. Response Actions, Timeframes, Resources and Costs

In the context of recovering a Rwandan national identity, the idea of the reconstruction of the Royal Capital in Nyanza emerged. The idea behind it was that restoring the cultural value of the last Royal Capital of pre-colonial Rwanda could tangibly show the originality of traditional Rwandan architecture. This project was led by the former Director of the Institute of National Museums of Rwanda-INMR, Professor Dr Célestin Kanimba Misago, an archaeologist educated at Lubumbashi University in the Democratic Republic of Congo with a PhD obtained in Hamburg, Germany. Professor Kanimba Misago held the top post at the INMR from 1996 and in 2008, he was elected President of the Board of Commissioners of the National Commission for the Fight Against Genocide (CNLG for its initials in French: *Commission Nationale de Lutte contre le Génocide*). He passed away on 20 July 2010, having achieved the reconstruction of three traditional huts.

Professor Kanimba Misago was a recognised scholar and important figure during the recovery process. He read descriptions and accounts of the capital in Nyanza,

and invited elders who lived in Nyanza with whom he discussed the possible layout. Even though there is no record of the decision, it is clear by looking at the reconstruction that the design was adapted from the traditional hut kept in the Ethnographic Museum in Huye, where Professor Kanimba Misago was based. However, the hut in Huye was much smaller than what Professor Kanimba Misago envisioned for Musinga's Royal Hut. According to the photographs of the beginning of the twentieth-century, the Royal Hut was much larger than the one showcased in Huye. The traditional knowledge on building techniques had been neglected after the Genocide, and at the first construction attempt, the building collapsed. With skilled elders known as *Abagorozi* (architect in traditional Rwanda) led by Mr Eulam Mugananganzo from Kabagari, (fig. 19) in central Rwanda and engineers trained in Germany, led by Mr Alphonse Kalisa Setako, Professor Kanimba Misago managed to build the present structures of the three traditional huts (figg. 20 a-d). The original idea was to reconstruct the ensemble of sixteen huts as these were described by Bernard Lugan's account referred to above.

In the context of modernisation and economical reconstitution as a priority for Rwanda after the Genocide, Professor Kanimba Misago's project was a way to use culture for recovery. It was not the first attempt at reconstituting this cultural element; in the late 1980s, on the same Rukari hill, a traditional hut was constructed to be used by the national ballet, *Urukerereza* in its cultural performances. Materials were collected from the hills around Rukari by members of the ballet and *Abagorozi* guided the construction works according to Mr Jean Baptiste Nkurikiyinka, a staff member of the National Ballet (fig. 21). These materials were made of *urubingo* (*pennisetum purpurem*), *urukangaga* (cyperius latifolius), and *uruguhu* (miscanthus sp). Today, such materials are only found more than 100 km. from Rukari.

Because it was not possible to use the original location in Nyanza hill, the Royal Capital had to be reconstructed in a different area, where there would be enough space to reconstruct the whole with its main sixteen huts. The area chosen was next to the palace in Rukari built in 1932 for King Charles Mutara III Rudahigwa, and where his first traditional huts were located when he succeeded his father King Musinga.

Images, Clockwise from top left:
Fig. 19. Skilled elders
Fig. 20a-e. Building three huts in the traditional style
Fig. 21. Traditional hut on Rukari hill
built for the National Ballet

In this way, the project of reconstruction did not follow the traditional system of selecting the hill or not constructing in a sacred area where a previous king used to live. Nevertheless, the reconstruction required an in-depth research on the traditional building system in which King Musinga's huts were originally constructed. This implied research on the materials, techniques and processes for construction. However, no documentation of the research or the reconstruction plan remain, besides the publication of 2008 referred to above which does not state specifically that it describes the reconstruction of Musinga's Royal huts.

A fundraising campaign was carried out in order to collect funds for the reconstruction of the Royal Capital. It was organised by natives and their friends from Nyanza and surrounding areas and held in
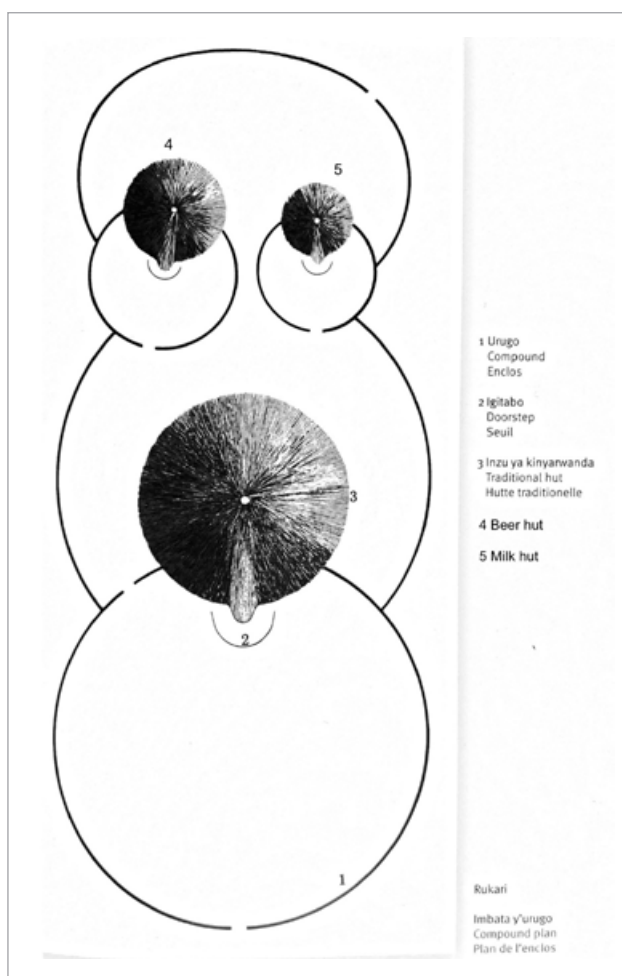

1 Urugo
Compound
Enclos

2 Igitabo
Doorstep
Seuil

3 Inzu ya kinyarwanda
Traditional hut
Hutte traditionelle

4 Beer hut

5 Milk hut

Rukari

Imbata y'urugo
Compound plan
Plan de l'enclos

Fig. 22. Layout of the first three huts reconstructed for the Royal Capital following Luga's description

December 2003 in Kigali. The idea was to combine the reconstruction of the Royal Capital with the construction of an *Olympic city* in Nyanza.[20] With the aim to follow the tradition of keeping the royal court as a centre for the development of different artistic and sporting activities, the plan was that Nyanza would become a hub for Rwandan athletes and a repository for Rwanda's traditional performances (dances, music, poems). Approximately RFr76 million (roughly equivalent to US$139,000 at the time) were raised for setting up this project as a cultural tourism attraction.

With that amount, some people were expropriated from earmarked areas to build the museum and areas for sport activities. But the proposal for sport facilities never came up and only the Museum's proposal was carried on at Rukari hill.

The main activities were carried out from 2003 to 2007: expropriation for land extension, reconstruction of three traditional huts, rehabilitation of the 1932 building or King's Palace, creation of pedestrian paths, a garden, construction of an admission house, and the lighting of the site. Development of the King's Palace Museum at Rukari hill was estimated to cost around US$450,810 for this first phase.

From 2010, other activities were undertaken such as further expropriation and the introduction of traditional cows – *Inyambo* – at the reconstruction site.

The first three huts reconstructed for the Royal Capital – following Lugan's description – are Hut II, where the King lived, Hut XII where the beer was stored, and Hut XIII where the milk was kept. Figure 22 shows the layout of these three huts.

The beer and milk huts were the first ones to follow the reconstruction of the main hut due to their functions. For instance, milk used to be the sacred drink to feed the king and his close assistants. This relates to customs of traditional Rwanda, where nobles would not eat like ordinary people, but were thought to live on milk. This tradition is directly connected to the important position of the native cows (fig. 23) in pre-colonial Rwanda and the pastoralist traditions related to their breeding (Rugeyo and Van Pee 2018: 43–83).

▶
Fig. 23. Native
cows *(Inyambo)*

In the case of beer, this beverage made of banana had an important place at the court as a social element. The beer was needed to ease discussions during cultural evening gatherings (*ibitaramo*) at the Royal Capital, and it was very important for people to commit themselves for higher performances (*imihigo*) during various battles with enemies or other important tasks. Beer was also the first refreshment offered by a host, and the royal court was always busy with guests coming for various reasons such as administration, justice, or entertainment.

There are currently plans for the development of Rukari hill as a cultural village (Art Sec Ltd 2018). In this project, it is expected that the remaining huts of the Royal Capital will be reconstructed, and more elements added, such as performances and recreations of the royal court. The reconstruction then, will not only consider the tangible elements, but will also re-enact the way Rwandans used to live in pre-colonial times. It is expected that this museographic proposal will be a good tourist attraction and will increase the development of this sector, beyond the current touristic focus of national parks. It will also recover and showcase elements of Rwandan traditional culture. The full project of the sixteen huts is planned to be achieved by 2022.

5. The Outcomes and Effects

Currently the three reconstructed huts are part of the King's Palace Museum, and together with the restored

palace of the son of King Musinga, it intends to show how the kings used to live, one in the pre-colonial Rwanda, and the other, in the colonial times. These have become elements for promoting cultural tourism, and also to promote an understanding of Rwandan history (fig. 19e).

The reconstruction of the Royal Capital later considered the allocation of a space to showcase the Rwandan cows *Inyambo* (fig. 23) as an important cultural element of the national identity. The Museum's idea is that the traditional huts and the cows showcase a live picture of what life at the royal court could have been like. The purpose of the INMR is that with the narrative associated with the reconstruction of the huts, and the presence of cows at the court, visitors can experience the way the Rwandan society was organised in the past, and the traditional knowledge Rwandans used to carry. Narratives around the setting and functioning of the Royal Capital and the intangible cultural heritage connected to the structures of the huts are provided during the guided visits. Besides social relations, the relationship between humans and nature is explained (use of plants as materials for construction and their symbolic meanings), as well as the Rwandan belief system composed of taboos, ceremonies and worship of *Imana*. Once inside the hut, the occupation is explained, in terms of the functions of the different areas of the hut as described in section 1, and according to the status and gender of the occupants.

Umuganura, an annual festival held on the first Friday of August is planned to take place in the area of the King's Palace Museum from 2020 onwards.

This practice was established in relation to the implementation of the UNESCO 2005 Convention for the Protection and Promotion of the Diversity of Cultural Expressions since 2017, led by the Ministry of Sports and Culture. One of the objectives in re-creating this festival has been to preserve Rwandan culture by educating the youth on the importance of safeguarding Rwandan cultural heritage, related to agricultural practices. The establishment of *Umuganura* or harvest celebrations has not only contributed to the rebirth of national pride and sustainable agricultural practices but has also been adapted to serve as a platform for reflection and adoption of bottom-up solutions for sustainable socio-cultural development.

However, in terms of the principles of authenticity, the reconstruction of the Royal Capital in Nyanza does not comply with the truthfulness of materials, substance, form, function, location, setting, or even spirit and feeling, as it is based on an interpretation of what the Royal Capital might have been. The reconstruction follows a projection of the description of Bernard Lugan contrasted with testimonies of Nyanza elders, and is not based on written documents or recorded layouts. With the support of pictures that were taken at the time of King Musinga at the beginning of the twentieth-century, the approximate calculation of the size of the huts was established. As the project was desacralised from its original and traditional context, the original purpose as the residence of the King has been changed, and furthermore, the design of the hut was based on a different existing hut, it could be asserted that the reconstruction of the Royal Capital is the hypothetical reconstitution of a symbol using fragments of heritage. These reassembled pieces attempt to restore a certain architectural essence that the original buildings could have had. However, certain materials that were traditionally used, such as the cow dung, for the floors inside the huts and the entrance (*Igitabo*), have been replaced by cement in order to protect the huts from humidity and eventual flooding, as well as to avoid the characteristic strong smell of the original material. Nonetheless, all materials used for building the Royal huts were new, because of the total destruction of the original, and its intrinsic impermanence.

Therefore, the reconstruction of the Royal Capital raises questions on how much the oral tradition can be regarded as truthful in terms of classical authenticity principles, or how this could be tested in an objective or scientific manner. Moreover, it questions the relevance of authenticity in a context of social recovery, and when the purpose of the reconstruction is one of healing and rebuilding national identity, and not intended to be dominated by accuracy.

Since the few historical buildings remaining after the Genocide belong to the colonial rule (Kandt House Museum built in 1908–1910, the King's Palace built in 1932, and the former Kigali Central Prison[21] built in the 1930s), the Royal huts aim to illustrate the architecture of pre-colonial Rwanda, and the significance of their reconstruction lies in this. Due to post-Genocide policies of modernisation explained in section 2, there are no other remnants of the Rwandan vernacular architecture (except for the traditional hut in the Ethnographic Museum, as explained above).

However, an outcome of this reconstruction is the replication of the Royal huts for tourism development and attraction. For example, some eco-lodges were directly inspired by the Royal huts in Rukari hill (fig. 24) and were intended to recreate the traditional architecture so as to be attractive to the public. Clear authenticity issues arise, especially when the re-transmission of the source is also unclear. Hence, the replicating of the reconstructed Royal huts, without an understanding of the construction system and the sources could lead to the problematic transmission and interpretation of Rwandan vernacular architecture. Therefore, it would be important for the presentation and interpretation of the reconstructed heritage resources, that the history of the reconstruction and the re-assembling of different elements as heritage fragments are acknowledged and explained, as it is in this recount.

The reconstruction of the Royal huts has also inspired a contemporary icon in Rwanda – the symbol of the recovery of the country and the opening of Kigali as a host city for international events – namely the Kigali Convention Centre. This building was designed by German architect Roland Dieterle and inaugurated in 2016 (fig. 25). Thus, the reconstruction of the Royal huts is also affecting contemporary architecture and recognition of the traditional hut as a symbol of Rwanda.

From top to bottom:
Fig. 24. Eco-lodges for tourism, inspired by the Royal huts in Rukari hill
Fig. 25. Kigali Convention Centre in the distance

Following the National Policy of Unity and Reconciliation (NURC 2007), ethnicity cannot be addressed, as the purpose is to form a united Rwandan identity. Therefore, understanding how the selection on the reconstruction of the Royal Capital to symbolise "Rwandanness" is perceived by different communities and different stakeholders cannot be openly questioned. Moreover, even if the Royal Capital was the residence of the King, and represented the way of life of an elite, the reconstructed Royal huts represent first and foremost the architectural tradition of Rwanda, proper to the hilly landscape and adapted to the environmental conditions of its geography and climate. By recognising that the inspiration for its architecture lies in a typical traditional hut, it should be clarified that the reconstruction of the Royal huts synthesises a Rwandan inhabitation strategy, that varied from region to region according to materials at hand and slightly different environmental specificities. In that sense, the Royal huts embody a key for understanding the Rwandan cultural landscape characterised by the hill system.

Learning to read the Nyanza landscape could support the understanding of the history of Rwanda from the kingdom to the present. The hills of Rwesero, Rukari, Mwima, and Nyanza form a system that could be used to effectively explain to nationals and foreigners how the cultural landscape was organised in the past (Map 2). Together with the former site of the Royal Capital, where the sacred *ficus* stands and the church remains, these sacred sites, now cultural spaces, are connected visually and through their interrelations, narrate a piece of the history of Rwanda, which is little known. The creation of a cultural itinerary that would further connect this to the Nyanza Genocide Memorial, which commemorates the approximately 12,000 people that were killed in the school that stood on the site, and the *Imidugudu* in Rwesero, (fig. 25) would support further the transmission of the evolution of Rwanda's landscape.

To look beyond the architectural elements and think about the larger cultural landscape would mean recognition of the value of the terraces in the hills,

Map. 2. Map showing Rwesero, Rukari, Mwima, and Nyanza hills explains how the cultural landscape was organised in the past

Fig. 26. Terraces in the hills

which are historical remnants still appreciated in the present (fig. 26). Furthermore, reconsidering and valuing both the agricultural and pastoralist landscapes, including agroforestry, would also contribute to avoiding soil erosion and retaining water, issues of utmost relevance in the face of climate change, and the degradation of Rwandan agricultural land. The hill system represented a holistic system of adapting to the geographic conditions, considering not only cultural, social, but mostly environmental conditions. So far, in this reconstruction project, attention has not been paid to the hill system, focusing only on the reconstruction of pieces of it. To reinforce the interrelations found in the hill system, acknowledging the interdependence between the different landscape practices could potentially contribute to the building of a stronger path for reconciliation.

6. Additional Comments

This research attempted to understand the recovery process of the cultural landscape in Rwanda after the Genocide. In the course of the investigation, it was found that the reconstruction of the Royal Capital in Nyanza was the clearest effort to re-value and reconstitute Rwandan cultural heritage in the aftermath of the Genocide. However, the inquiry on the reconstruction led the authors to realise the existing gaps and research needs in order to comprehend Rwanda's past and cultural heritage. The lack of records documenting the reconstruction process hinders the understanding of construction techniques, as well as the planning and funding processes for this endeavour. There do not seem to have been any approaches to international bodies or international cultural heritage experts that could have kept records or documentation during the process. Therefore, this research became the re-assembling of a puzzle that still has missing pieces. The authors would like to acknowledge these limitations.

Furthermore, the reconstruction of the Royal Capital in Nyanza points at recurrent issues in the heritage conservation field and at some lessons for recovery and reconstruction in post-trauma contexts. First, the selection of what to reconstruct and recover comes to mind, when, at first glance, the idea of reconstructing a Royal Capital which represents the lifestyle of an elite and a minority that was in power in pre-colonial times could be questioned by communities which do not identify with this specific group. Even if this decision could be contentious by not having followed a larger consultation at a national level, the findings of this research, point at the model used for this reconstruction: a traditional hut. The focus then shifts from the idea of celebrating the royal to the idea of recognising and remembering the fundamental worldview of inhabiting this particular geography.

Second, the reconstruction of this particular architectural element brings back an important body of knowledge that does not refer to a specific group, but to the fundamental relationship between communities inhabiting Rwanda in pre-colonial times and which has been resilient to colonial rule and war. By undertaking the reconstruction, the symbolic significance of the architectural elements in the building of a traditional hut are recorded. What becomes relevant in this process of reconstruction is how it became a space for recovering traditional experience and local capacity with the use of traditional techniques and skills. Locals and especially elders were consulted, and it shows a different approach to reconstruction, one that is informed by its own cultural practices. Third, the official statutory heritage designations become problematic in a context where significant places do not necessarily retain material evidence, but where the recognition of value is related to oral narratives and elders' traditional knowledge. Added to this, the question also entails the understanding of heritage for diverse communities, such as in this context, where significant places are observed as sacred places as they save the memory of an event or the residence of an important leader. Elements are ephemeral, and heritage is conveyed through oral narratives. It is a place, but its boundaries and components are not distinct. Fourth, the idea of an ephemeral heritage remains to be scientifically documented and questions the classic conservation approach that focuses on the material. When the documentation is not available, where should the focus of reconstruction efforts go? The interpretative reconstruction of the Royal Capital shows the limitations of the application of the concept of authenticity in the case of ephemeral heritage resources. It raises the question of how authenticity could be addressed scientifically in cases where the heritage resource is inaccessible, the research funds are limited, and the sources of information rely on oral history, traditional knowledge and elders' testimonies.

Even though reconstructing the traditional huts as a way of life and as a way of recovering the cultural landscape is neither feasible nor desirable, learning from the traditional knowledge they transmit could be helpful for developing strategies connected to the Rwandan culture as it evolved in this territory. In this way, heritage could inform a development that does not break with history and that relies on resilient practices. Yet, the recovery and reconciliation processes that underpin development need to recur to an open dialogue with the diverse communities inhabiting Rwandan territory for it to be sustainable.

7. Details of the Experts Completing the Case Study

Maya Ishizawa is a Peruvian architect with a master's degree in Media and Governance from Keio University, Tokyo, Japan, and a PhD in Heritage Studies from BTU Cottbus-Senftenberg, Germany. Her research has focused on issues related to the conservation of cultural landscapes, especially in mountain areas of the Andes, the Pyrenees and Japan. She has been in charge of coordinating the activities of the UNESCO Chair on Nature-Culture Linkages in Heritage Conservation at the University of Tsukuba, Japan, where she engaged in the training of cultural and natural heritage practitioners in Asia and the Pacific, looking at developing a comprehensive approach to heritage conservation. Currently, as a senior research fellow at the Institute of National Museums of Rwanda-INMR, she is interested in exploring the cultural landscape of Rwanda, as a way to understand the history of a country ravaged by colonisation, civil conflict and genocide. She is the leading author of this case study.

Jérôme Karangwa is the Director of the Research and Publications Unit of the Institute of National Museums of Rwanda-INMR. He is a historian from the National University of Rwanda, with a post-graduate diploma in Museums and Heritage Studies from the University of the Western Cape, Capetown, South Africa. He has also been trained under the Africa 2009 Programme on nominations to the World Heritage List. He possesses extensive research experience in Rwanda, studying the country's heritage sites and their remnants of colonial influence. He has managed research teams, contributed to exhibitions and publications, and held leadership positions at the Ethnographic Museum, Museum of Environment, and the new Rwanda Art Museum at Kanombe in Kigali City. He was assistant to the Director General of the INMR, Dr. Célestin Kanimba Misago when he started the project of the reconstruction of the Royal Capital in Nyanza. He has contributed to this case study with his local and scientific knowledge, as well as with his personal experience in the process of reconstruction and further plans of the INMR.

Notes

1. From 28 August 2020, INMR has been absorbed by a new institution called Rwanda Cultural Herit-age Academy that comprises Rwanda Museums, Heritage sites, National Archives and Library and the responsibilities of the former Rwanda Academy of Language and Culture.

2. Another case is a royal capital seen by Adolf von Götzen, German explorer and Governor of German East Africa, in 1894 when he was received by King Rwabugili, father of Yuhi V Musinga, in his royal residence in Kageyo, Ngororero, Western Province of Rwanda (Von Götzen 1899; NURC 2016: 167).

3. In 1897, Richard Kandt arrived to Rwanda, as an explorer of the Great Lakes region in search of the source of the river Nile. In 1899, Rwanda was incorporated to German East Africa. After the First World War, the German imperial rule in Rwanda came to an end.

4. The Belgian colonial rule started in May 1916 with a military occupation.

5. By then, a department of the Institute of Scientific Research in Central Africa (IRSAC).

6. Description taken from Kanimba Misago & Van Pee 2008, pp. 35–39.

7. In the tradition of the Kingdom of Rwanda, the rulers were the King and the Queen Mother, mother of the King. The king was a representative figure and symbol of God (*Imana*) on Earth, while the queen mother was his principal advisor.

8. As pointed out by Lugan, similar settlement patterns have been found in Burundi, a neighbouring country of Rwanda in the South. Archaeologist John Giblin also asserts that similar pre-historic and pre-colonial archaeological structures can be found both in Rwanda and Burundi (Giblin *et al.* 2011).

9. Originally this national park was a forest reserve designated by German administration in 1903.

10. At the time, Huye (Butare), capital of Huye District in the Southern Province of Rwanda was called Astrida, in honor of Queen Astrid of Belgium.

11. His mother was Nyiraruganzu Nyakanga (Abasinga clan) and his wife Nyakiyaga (Abega clan). In parallel, the Bugesera Kingdom was ruled by Nsoro Bihembe and the Gisaka Kingdom by Kimenyi Musaya.

12. *Paysannat* land settlement system consisted of a re-organisation strategy from the Belgian colonial rule to locate the rural population spread in the hills, in areas closer to transportation routes and concentrated in small villages. In this way, the population was easily controlled and organised.

13. These are the present names of these hills. In the past these names may have been different.

14. Authors' free translation from French original text.

15. This is the official number according to the government census.

16. The ICTR was officially closed on 31 December 2015 (https://unictr.irmct.org/en/).

17. Vision 2020 is the government strategy for Rwanda to transition from a low-income, agricultural-based economy to a lower-middle income, knowledge-based economy by 2020.

18. Also called "Home grown solutions" or "Home grown initiatives".

19. In 2002 *Gacaca* courts were revived by the Rwandan Government, as a way to process the millions of criminal cases that arose following the 1994 Genocide committed against Tutsi. See the Organic Law N° 40/2000 of 26 2001 setting up "*Gacaca* Jurisdictions" and organising prosecutions for offences constituting the crime of Genocide or crimes against humanity, committed between 1 October 1990 and 31 December 1994. *Gacaca* is defined as a traditional Rwandan restorative justice which has been revived to deal with genocide cases. Their original objective was to find out truth, rather than punishment, and to reconcile perpetrators and victims. *Gacaca* judges known as *Inyangamugayo* were elected on the basis of integrity. *Abunzi* are the community reconcilers who resolve day-to-day conflicts before referring them to the ordinary jurisdictions. *Umuganda* is a traditional community support system for individual and national causes, which has been revived in the interest of national reconstruction.

20. The Olympic city, a project later called <<Olympafrica>>, aimed at community development through sports activities and was launched in 2009 by the Rwandan National Olympic Committee (RNOC). The project was planned as two main premises: one would contain basketball, handball, and volleyball courts and the second one would be composed

of the Mini-football pitch and athletics (The New Times, 14 August 2009, "Olympafrica project gets underway" https://www.newtimes.co.rw/section/read/9981). Unfortunately, the project was called off due to disagreements between entities in charge, and currently in Nyanza district there is only a stadium that was there before the Genocide.

21 The building of the former Kigali Central Prison is currently being demolished to make way for a new development of Kigali city.

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POST-WAR RECOVERY OF THE OLD CITY OF ALEPPO: THE REHABILITATION OF *SUQ* AL-SAQATIYYA AS A PILOT PROJECT

Ruba Kasmo and Lina Kutiefan

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1. The Heritage Resource and its Context Before the Impacting Event(s)

1.1 Description, Designation and Its Context Before the Impacting Event(s)

Suq al-Saqatiyya is one of the numerous *suqs* (markets) located in the central commercial zone of the Old City of Aleppo (fig. 1). The zone covers an approximate area of 16 hectares and has been the core of public life in the city since ancient times. This core is filled with markets, commercial facilities, manufacturing units, religious buildings and public services. Starting from the thirteenth-century, the zone became the international face of Aleppo which hosted the trade caravans, merchants, European communities, consulates and religious missionaries. The diversity of functions and buildings provided the zone with a vital and dynamic atmosphere during the days and nights despite the continuous changes of its socioeconomic role within the city. Until very recently, the zone was a major trade centre for both daily and tourist goods.

The two backbones of this zone as an urban core are the thoroughfare, which connects the city's citadel in the east and the Antioch Gate in the west, and the large plot on its northern side where the Great Umayyad Mosque is located today. In his hypothetical reconstruction of ancient Aleppo, Sauvaget proposed that it had a regular Hippodamean plan, with the main route (via Recta) extending from the city's western gate to the Acropolis. He also proposed the presence of an agora (on the site of the Great Mosque) and a temple to its west. In the Roman period, the Hellenistic via Recta became the main Decumanus. In the sixth-century, the temple was replaced by the Byzantine cathedral of Saint Helena and the main avenue started to be a market area. After the Islamic conquest, the Great Umayyad Mosque was built around 717 AD beside the Byzantine cathedral and constituted the focal point around which the *suqs* started to grow (Sauvaget 1941: 41–46). The *suqs* were vast, sumptuous and provided with timber roofing to shade the shoppers. However, they have burnt down several times and been consistently rebuilt in the same area. The oldest remaining *suqs* in the commercial zone today cannot be dated earlier than the late fourteenth-century when the Mamluks built several vaulted *suqs* to the east and the south of the Great Mosque. These *suqs* are small and constricted, with frequent turns and breaks. Their barrel vaults rarely exceed the breadth of a single shop below (Kasmo 2013: 23).
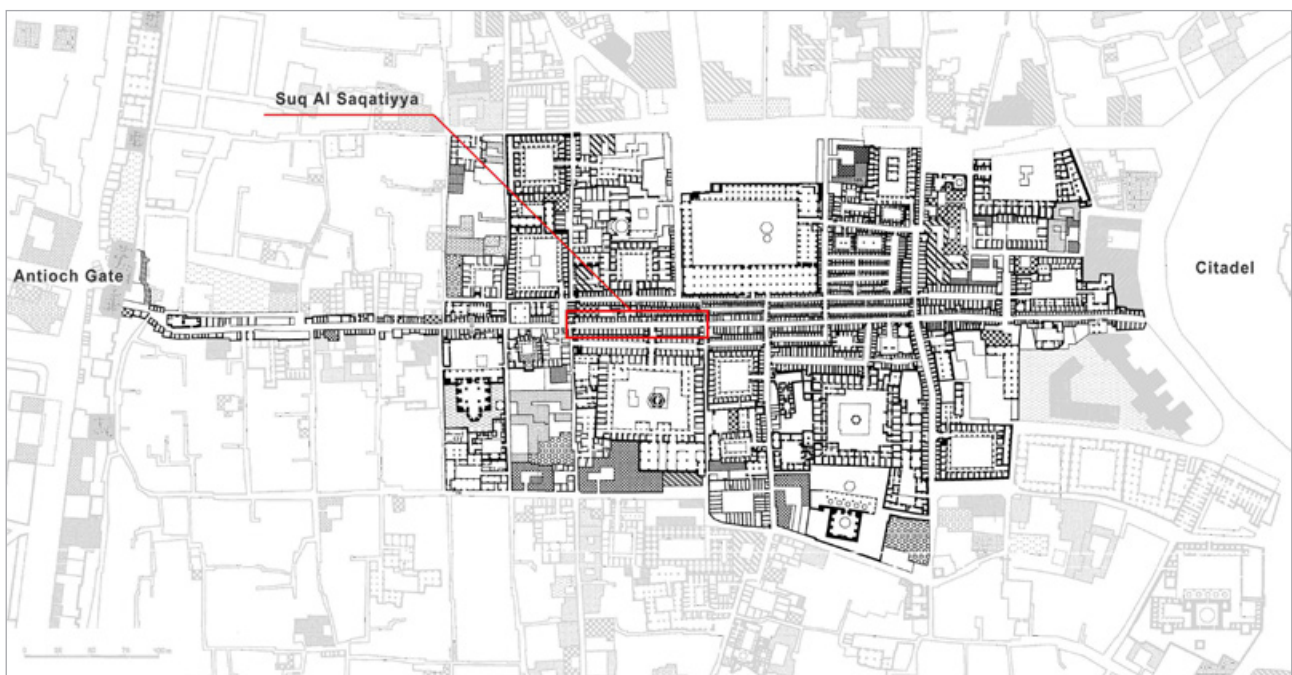

Fig. 1. The central commercial zone of the Old City and the location of Suq al Saqatiyya, prepared by the author based on the map of Gaube and Wirth 1984

The geopolitical changes in the region during the fifteenth-century gave an important boost to Aleppo's position as an international trade centre. The need arose to establish a commercial zone that can offer well-maintained amenities as well as protection to the merchants traveling with the caravans. Consequently, the central market zone expanded to include large *khans*, established by the city's governors and officials, in association with retail *suqs* (Kasmo 2013: 24). The favourable conditions continued during the sixteenth-century and fuelled the city's economic, demographic and urban growth to become the third city of the Ottoman Empire after Istanbul and Cairo. The demand for space for commercial and production activities was strong; and the large Ottoman complexes answered this demand. These complexes, by their extensive size, their architectural quality and the diversity of occupations they accommodated, doubled the commercial core of Aleppo and transformed it into an economic quarter called "el-Mdineh"[1] (Raymond 1984: 28). This commercial core consisted of interlocking streets, filled with shops, workshops, mosques, baths, *khans*,[2] and *qaysariyyas*,[3] all under one contiguous roof.

Within this context, *Suq* al-Saqatiyya was built in 1574 as a revenue-generating property belonging to the foundation of Sokullu Muhammed Pasha[4] (al-Ghazzi 1992: 2: 416-423). The *suq* constitutes an architectonic integral structure of a complex comprising Khan al Gumruk (The Custom Caravanserai), two *qaysariyyas* (manufacturing facilities) and three *suqs* and covering an approximate area of 1 hectare. While Khan al Gumruk was a centre for long-distance trade and attracted consulates, the *suqs* and the *qaysariyyas* housed local activities. Due to its location, overlooking the main thoroughfare of the central commercial zone, there is a big probability that *Suq* al-Saqatiyya has been dealing with the daily needs since its construction. Its name is derived from "saqatat" which means organ meats or offal in Arabic. About half of its shops were occupied by butchers while the rest were selling nuts, pistachio, fruits and vegetables (Hretani 2006: 78-79).

The layout of the *suq* follows the typical layout of the linear *suqs* where shops are arranged along the two sides of a central passage (Figure 2). However, being a part of a grandiose waqf, the *suq* surpasses its

counters in the commercial zone with its dimensions and monumentality. It is a two-story high structure covering an approximate area of 1,500 square metres with a length of 98 metres and an approximate width of 4.8 metres. The main passage is covered with a series of cross vaults punctuated by four domes with *oculi*. Beneath each vault, there are two shops in the ground floor topped with a pair of windows looking out from the upper storerooms. All of the shops are roofed with vaults. The *suq* has three entrances closed by large wooden doors; two at the western and eastern ends of the central passage and one in the middle of the *suq's* southern side connecting it with the parallel *Suq* Khan Al Gumruk. The *suq* is built using finely cut limestone for walls, rubble limestone with lime-based mortar for vaults, bricks for domes and basalt for the pavements. The binders and plasters are all made of lime-based mixtures. Timber is limitedly used for the shops' lintels. The limestone is used as dressed blocks (ashlars) for walls and pendentives. For the walls inside the shops and the vaults, the blocks are roughly hewn and covered with lime-based plaster. The cores of the structural elements are filled with rubbles mixed with mortar. The domes are built with rows of brick blocks and plastered. A traditional mixture of boiled soap and water is applied on the external surface of the plaster to enhance its resistance to weathering and cracking.

1.2 History and Context

The central commercial zone developed in a coherent urban pattern and maintained its traditional features up to the early twentieth-century. Although, the earthquake of 1822 had caused severe damages in some parts of the commercial centre, the reconstruction and restoration works seemed always to follow the traditional building techniques. The master plans of the twentieth-century had their repercussion on the historic commercial centre. This started with the partial implementation of Gutton's plan of 1954 which proposed to separate the centre from the surrounding urban fabric by an interior ring road in order to give it a direct vehicular access. In fact, the isolation of the centre and clearing of its surrounding fabric corresponded to the idea of "exposing" a monument to spectators (Bianca *et al.* 1980: 28). The execution of the first phase of Gutton's proposal led to the full or
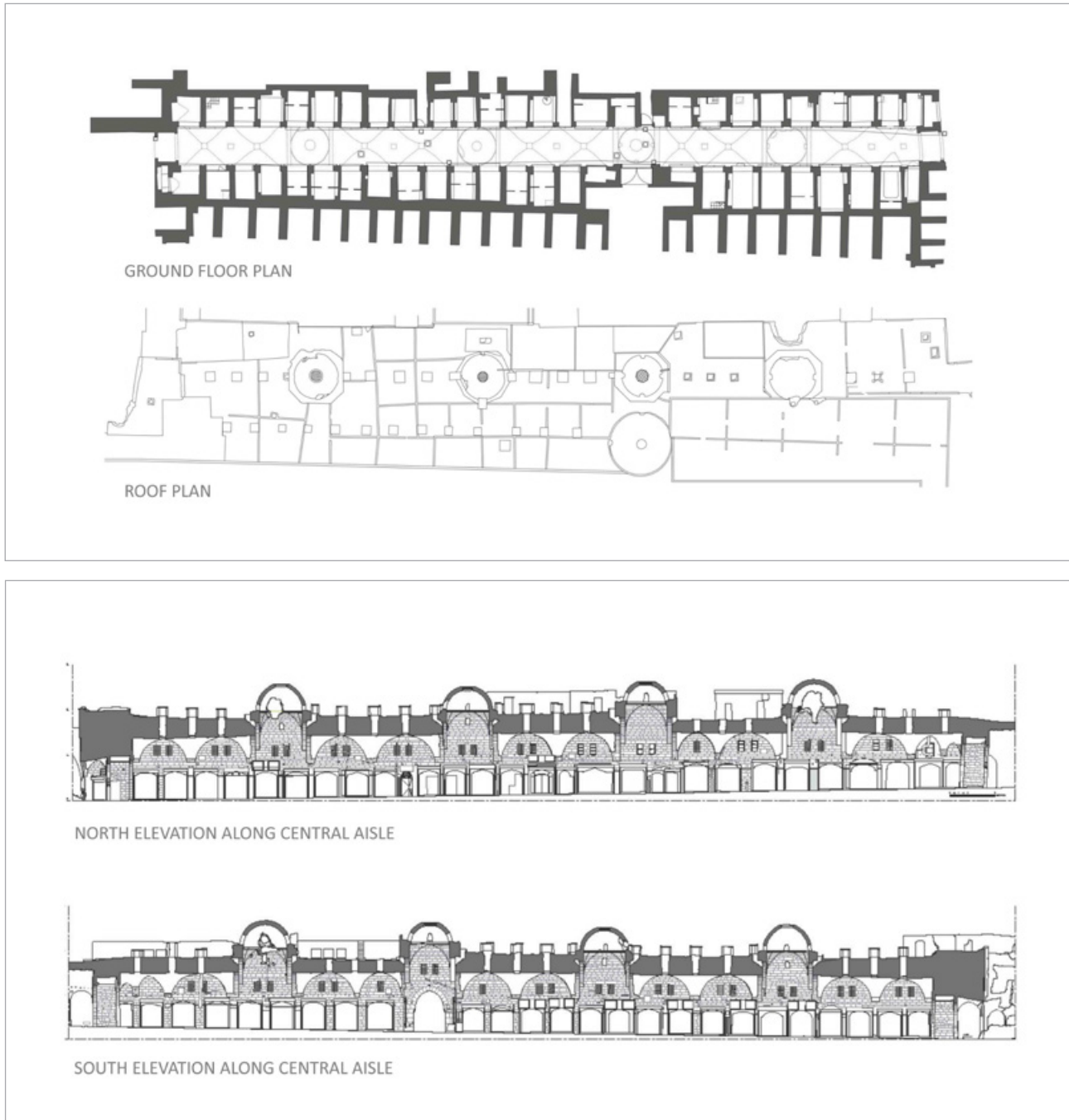
GROUND FLOOR PLAN

ROOF PLAN

NORTH ELEVATION ALONG CENTRAL AISLE

SOUTH ELEVATION ALONG CENTRAL AISLE

Fig. 2. The plan and sections of Suq al-Saqatiyya, from the architectural survey conducted by the AKTC team in 2018, (courtesy of AKTC)

partial destruction of some of the centre's important monuments and forced development pressures right into its heart. The newly opened streets, on the northern, eastern and western sides, cut the traditional thoroughfares leading from the centre to the city's gates, thus breaking the long established link with the extramural historic centres that had developed outside these gates. Through traffic created new commercial activities along the sides of the new streets and encouraged the replacement of old buildings with high-rise blocks causing the disruption of the traditional urban pattern. The 1974 Banshoya plan did not alter the basic concepts of Gutton's plan but tried to respond to its shortcomings.
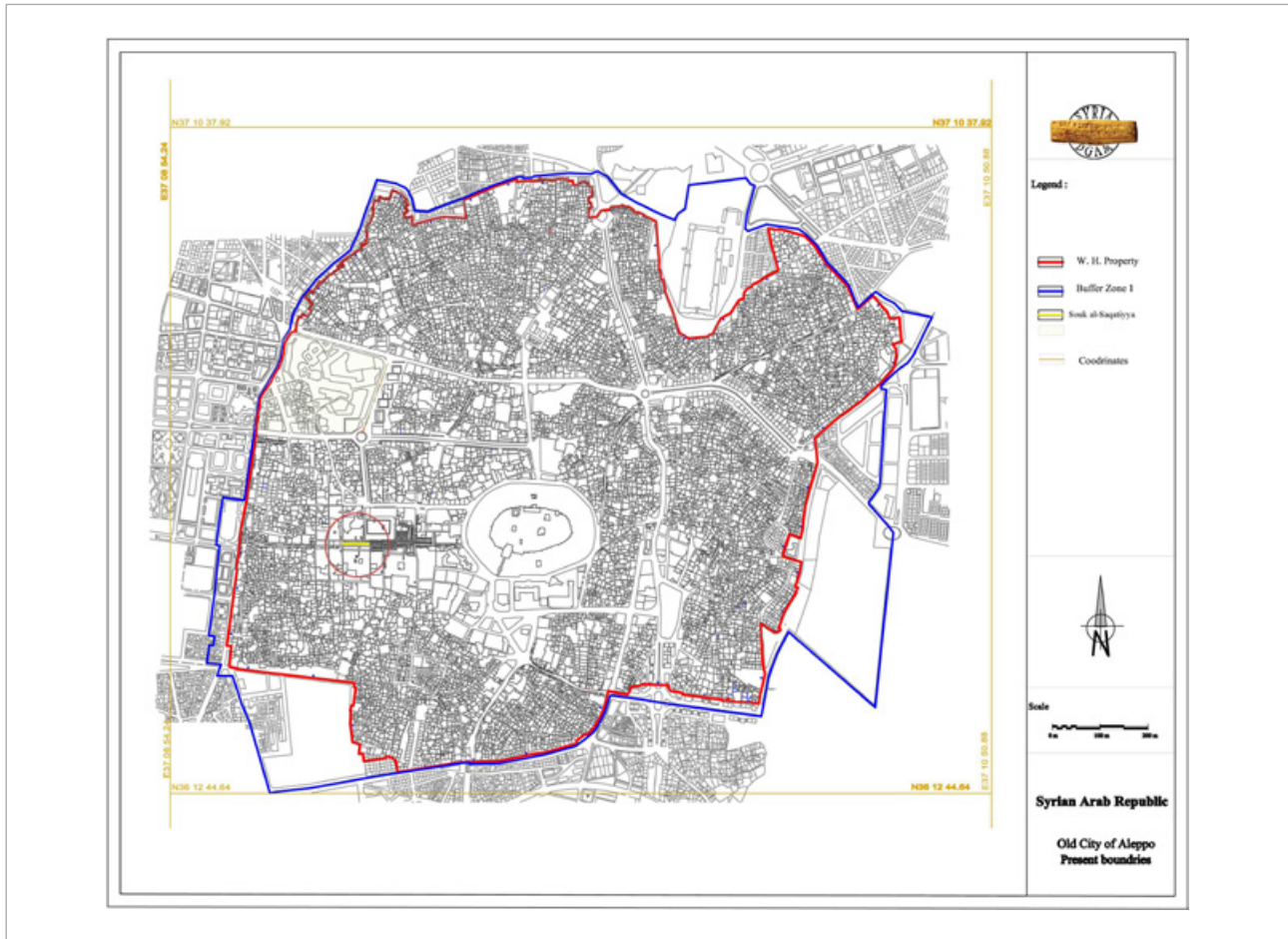
▲

Fig. 3. The map of the Old City of Aleppo showing the borders of the World Heritage Site, the buffer zone and the location of Suq al-Saqatiyya, (courtesy of DGAM)

The inner ring road was eliminated and replaced by a number of dead access ways in order to maintain the coherence of the fabric and to improve vehicular access (Bianca *et al.* 1980: 31). However, the Ministry of Culture declared the intramural part of Old Aleppo, including its commercial centre, as a national historic area in 1976 and ceased the implementation of the plans.

Later on, the Old City, with both its intramural and extramural parts, was declared a UNESCO World Heritage Site in 1986, based on two of the criteria foreseen in the Operational Guidelines (Criteria III and IV), reflecting the exceptional importance of its cultural traditions and of its past and living civilisations and the outstanding quality of the architectural outcomes of the different stages of its history (fig. 3). The brief synthesis of the site's Outstanding Universal Value refers to Aleppo's role as a trade city <<ocated at the crossroads of several trade routes since the 2nd millennium BC>> and to the *suqs* as <<a part of the city's cohesive and unique urban fabric that contribute to the Outstanding Universal Value>> and <<represents an exceptional reflection of the social, cultural and economic aspects of what was once one of the richest cities of all humanity>> (UNESCO-WHC 1986).

Although these actions succeeded in stopping further demolition, they did not reverse the damage that had already occurred and the decline of the commercial zone. The government's approach to development started in the mid-1980s with the promotion of development-oriented cooperation with international and regional counterparts. Thus, Aleppo's municipality sought funding to rehabilitate its Old City. Both the German Development Agency (GTZ, now GIZ) and the Arab Fund for Social and Economic Development agreed to contribute funds and a new project (The Rehabilitation

project for the Old City of Aleppo) was launched in 1992. In 1998, the "Old City Development Plan" was issued to document the rehabilitation project's vision, goals, objectives and framework. Since its issue, it has become the key instrument for guiding the development process of the Old City. The proposed measures for the historic commercial centre were:

• The area's boundary to be defined.
• Restoration, renovation, modernisation, decoration and maintenance works to be regulated for shops, buildings and streets. Classification of buildings should be developed.
• Retailers and warehouses with heavy supply traffic should be relocated outside the centre. Industrial activities (more than 50 workers and 10 machines) with bad impact to be relocated outside the centre.
• Service traffic to be regulated (time restrictions). Small vehicles and carts for servicing are allowed only (DOC-GTZ 1998: 102).

In the following year, the Directorate of the Old City (DOC) was formed to follow up on all rehabilitation activities. DOC works through two committees; the Protection Committee which includes the key actors in the Old City and is responsible for the coordination of rehabilitation plans, and the Technical Committee which is responsible for issuing the permits after checking the submitted restoration studies. In 2002, the "Land Use Plan" was ratified to be the most important spatial instrument in regulating the urban changes. It defined the allowable uses for buildings in the historic commercial centre as: commercial and retail operations, small offices, essentially non-disruptive businesses, traditional service facilities (e.g. public baths) and in exceptional cases, small traditional restaurants and small businesses providing accommodation in khans (DOC-GTZ 1998: 20).

It is undeniable that the conservation efforts of DOC had achieved significant results. Still, there were many obstacles that limited the desired impacts. These obstacles derived from legal, financial and social constraints. The main problem was the fragmented ownership. The four stakeholders that share the properties within the historic commercial centre are private owners, the General Directorate of Endowments,

the Directorate General of Antiquities and Museums (DGAM) and finally the municipality. The stakeholders are responsible for maintaining and restoring their properties under the supervision of DGAM and after obtaining the required permits from DOC. Among these stakeholders, the private owners had the largest share. Generally, the private shares are open to continuous division through inheritance and selling, causing further ownership fragmentation. Moreover, only marginal sections are occupied by the owners themselves; the majority of the properties are rented and tenants were quasi-owners with significant interests in their properties. Theoretically, the tenants were able to apply for maintenance works and the owners may be involved in funding, however, the high cost of work and the long bureaucratic procedures de-motivated many tenants. On the other hand, owners did not have the legal or administrative instruments to compel tenants to carry out maintenance works. In principle, owners and tenants could agree on joint maintenance or investment but, in practice, such agreements were difficult to implement; as different interests resulted in decision-making paralysis. Another important issue was that neither owner, nor tenant could use their shares in the Old City as collateral to secure loans from banks. This made it more difficult to mobilise resources for preservation. When there was a mutual willingness for maintenance, the works were limited to the private unit and unlikely to share or support major preservation of the structure as a whole (Rabenau 2003). In fact, municipal interventions have been performed for street paving, façade cleaning, and the unification of shopfronts and awnings in some sections of the central commercial zone. However, the practicality of these initiatives and their response to people's needs were questionable and generated controversial reactions among the occupants. While some have appreciated the improvements to the public space, others have criticised them for being superficial beautification that does not solve the real problems. They argued that streets were repaved before fixing the leakage of the deteriorated sewage infrastructure and façades restored before repairing the dilapidated structural elements. Therefore, it can be summarised that the poor infrastructure, the insufficient services and the high maintenance cost had de-motivated many of the owners and the tenants from undertaking major investment in maintenance.

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2. The Nature of the Impacting Event(s)

Following the outbreak of the crisis in March 2011, an armed conflict started in many regions in Syria. The conflict reached Aleppo in July 2012 and continued till December 2016. These five years of fighting resulted in a vast humanitarian crisis in Aleppo with loss of life and displacement of a section of the local population. Although there are no definite statistics, the authorities estimated that of a population of about 2.7 million people before the events, over a third have left the city during the war. At the same time, 800,000 refugees have fled to the city seeking safe settlement (DGAM 2018b: 6). On the physical scale, the conflict has also resulted in major destruction of the urban fabric and infrastructure which further disrupted the social and economic life of the city.

The World Heritage Site was particularly affected because the rebellious military groups controlled the eastern section of Aleppo while the western section remained under the government's control leaving the historic city in the middle as a battle frontline. Moreover, the urban fabric of the historic city with its narrow, breaking and covered alleys encouraged street combats. At the beginning, the fight concentrated around the citadel and then spread to cover the Great Mosque, the commercial zone and the surrounding residential neighbourhoods. The first severe damage within the commercial zone happened in September 2012, when a huge fire erupted in the covered *suqs* located at the eastern side of the Great Mosque causing the burning of about 1,500 shops. The roofs of several *suqs* collapsed while some other *suqs* were completely destroyed. Although there was no official statement about the cause of this fire, the local narratives indicate that the area had been set on fire by an electrical short circuit during the heavy fighting. The nature of the stored goods in the *suqs* such as textiles helped the fire to spread fast before it was brought under control. In the following months, the battle to take control of the Great Mosque caused additional destruction and heavy damage to the *suqs* and many monuments in the zone. The biggest loss was in April 2013 when the minaret of the Great Mosque, a masterpiece of Islamic architecture, collapsed. The damage in the commercial zone represented not only the disappearance of unique pieces of cultural heritage

but also the destruction of the emblem of Aleppo as a city of commerce. Therefore, it was considered by the population as a dramatic loss for the city patrimony. The fight escalated exponentially in the following years and extended to cover different locations in the city where numerous monuments were severely damaged or destroyed as a result of bombardments, underground bombs, shelling, fires and street combats.

Since the beginning of the war, DGAM, in collaboration with UNESCO, has deployed many efforts to preserve the cultural heritage of Aleppo, to rescue works of art and relocate the Museums' objects in safe havens. However, the increasing rate of damage in the city and the other Syrian World Heritage Sites prompted the World Heritage Committee in 2013 to inscribe them in the World Heritage List in Danger and to address their situation in the annual meetings as a clear expression of the concern of the international community for the conservation of their Outstanding Universal Value. The inscription has triggered many international initiatives to support training activities and raise awareness of the drastic condition of the cultural heritage of these sites. In particular, UNESCO in collaboration with ICOMOS and ICCROM, has implemented since 2014, an EU-funded programme, to conduct several technical meetings to discuss the situation in Aleppo. These annual meetings helped to bring the experts together, follow the condition of the cultural heritage of the city and prompt emergencies.

During the conflict years, it was difficult to access the site to conduct any surveys or damage assessments. The news on destroyed monuments was appearing on the online platforms, news reports and shared among people. Photos taken by some volunteers were also available. In addition, DGAM and several other international initiatives were publishing reports trying to describe the damage and to analyse them. However, none of these reports could provide solid and comprehensive information on the extent of the damage. The first documentation that provided such a thorough accounting of the impact of the war was done through a joint work of UNITAR and UNESCO. The UNITAR-UNOSAT analysts used the available commercial satellite imagery to assess the state before-during-and in the wake of the war providing a cumulative view of all visible damage.

Parallel to the physical assessment, the historical value of each building was assessed by UNESCO experts to determine the severity of the historical loss resulting from the destruction of key historical elements within a broader cultural site (UNESCO-UNITAR 2018: 25–26). The analysis of 518 cadastral plotted buildings showed that more than 10 per cent of the historic buildings of Aleppo were destroyed. More importantly, it was revealed that 51 per cent of the assessed buildings are moderately damaged and might be partially reconstructed or restored. The report emphasised the need for urgent interventions in the damaged buildings which are exposed to weathering and internal structural degradation over time (UNESCO-UNITAR 2018: 135). Therefore, the report was a tool to document the losses of the cultural heritage of the Ancient City of Aleppo on one side and to mobilise the decision-makers as well as the general public on the urgent need to safeguard and restore the remaining cultural properties on the other side. The results of the documentation were published in a comprehensive report in December 2018. The report, together with the other assessments, constituted an essential starting point to address the complex task of the recovery and to prepare an overall strategy for this process.

3. Post-Event Appraisals

Soon after the war had stopped, a technical coordination meeting was organised by UNESCO in Beirut on 2–3 March 2017 with the participation of all the concerned authorities and stakeholders. This meeting addressed the situation and recommended a first set of urgent actions aiming at stabilising and safeguarding the damaged monuments, preparing the restoration activities and reorganising the local capacities (DGAM 2018a: 15–16). The World Heritage Committee in 2017 recommended the implementation of the technical meeting's decisions and called on the local authority to urgently prepare a strategic plan to monitor the recovery process. The Committee has also addressed the issue of funding, calling upon UNESCO Member States to support emergency safeguarding measures through the UNESCO Heritage Emergency Fund. In response, the Syrian government set up the "National Higher Steering Committee for the Restoration of the Old City of Aleppo"

headed by the Ministry of Culture and represented by the General Directorate of Antiquities and Museums (DGAM), the Ministry of Public Works, Ministry of Housing, Ministry of Tourism, experts in the field of archaeology and restoration, the Aga Khan Foundation for Culture (AKTC), the NGO Syrian Trust for Development (STD) and representatives of the local community (DGAM 2018a: 16). The Steering Committee worked on three parallel tracks; the urgent interventions, the needs assessments and the development of a strategy for the recovery process of Aleppo. Within the framework of the urgent interventions, the main roads in the historic city were cleaned and re-opened. The debris of the destroyed and damaged buildings was removed, under the supervision of DGAM, with the support of UNESCO and UNDP (DGAM 2019: 5). The ruins were sorted and the valuable parts were fenced and protected. In addition, some urgent consolidation works were conducted on several monuments.

As regards the needs assessments, the AKTC, one of the international organisations that were active in the rehabilitation efforts of the historic city before the conflict, contributed to the damage assessment actions as soon as the war had finished. The team of the trust, in coordination with DGAM, conducted an analysis of three areas within the historic city from October to December 2017. These areas: the central commercial zone, the citadel and its surroundings, and the residential neighbourhoods of Bab al-Ahmar and al-Bayyada, were chosen because they have a central location within the historic city, contain the major monuments and have witnessed the worst damage. The analyses were conducted on the basis of the photographic records observable on the ICONEM digital platform. The latter consists of a 3D database and set of aerial views obtained from a drone-operated camera flying at low altitude (AKTC 2018: 5). This assessment gave more detailed information on the level of damage in the selected areas and came up with preliminary proposals for interventions and costs. In addition, two successive surveys of "Major Key Restoration Projects" and "Other Important Restoration Projects" have been requested from local inhabitants, including architects, historians, engineers and staff of the related authorities. As a result, two lists, twenty-five major projects and forty-five important ones, were prepared. Every project was prepared in a monograph format that contains a brief description of the building, an overall

damage assessment; a timeframe and a cost estimate. The accumulated results of the damage assessments were not taken as a substitute for the field inspections but rather as a guiding tool for addressing the needs and priorities. As for the central commercial zone, it was found that over 40 per cent of the structures in the zone had been either lost or severely damaged, requiring either full or partial reconstruction. The most significant loss was the destruction of the minaret of the Great Umayyad Mosque in 2013, while the mosque itself suffered considerable damage and spoliation. The remaining historic fabric (roughly 60 per cent) was affected by partial or limited damage, requiring some form of limited reconstruction or either full or partial rehabilitation (fig. 4). The reconstruction and rehabilitation cost for the central commercial zone was estimated roughly between US$50 and US$72 million (AKTC 2018: 27).

The UNESCO technical meeting had also recommended a set of assessments beyond the physical condition of the buildings and infrastructure. These assessments included the damage to the housing stock, the capacities of the local and national construction industry to acquire, produce and deliver building materials and to implement construction programmes, the social situation of the city and the war impacts on the intangible cultural heritage of the city, and finally the damage to the economic infrastructure in the city. All these assessments are to be mapped in order to have a good knowledge of the situation in the post-conflict phase at both the metropolitan level and World Heritage Site level, to facilitate the engagement of all the stakeholders in the recovery process and to allow the best possible use of the local resources (DGAM 2018b: 11–12). Although these assessments are not finished yet, it was clear from the first discussions that there is an urgent need for a workforce that is well trained in traditional building techniques and stone construction to reproduce the high-level finishes and decorative details of the damaged buildings. Therefore, a special meeting on traditional building materials and techniques was organised by UNESCO on 10–11 August in Aleppo.
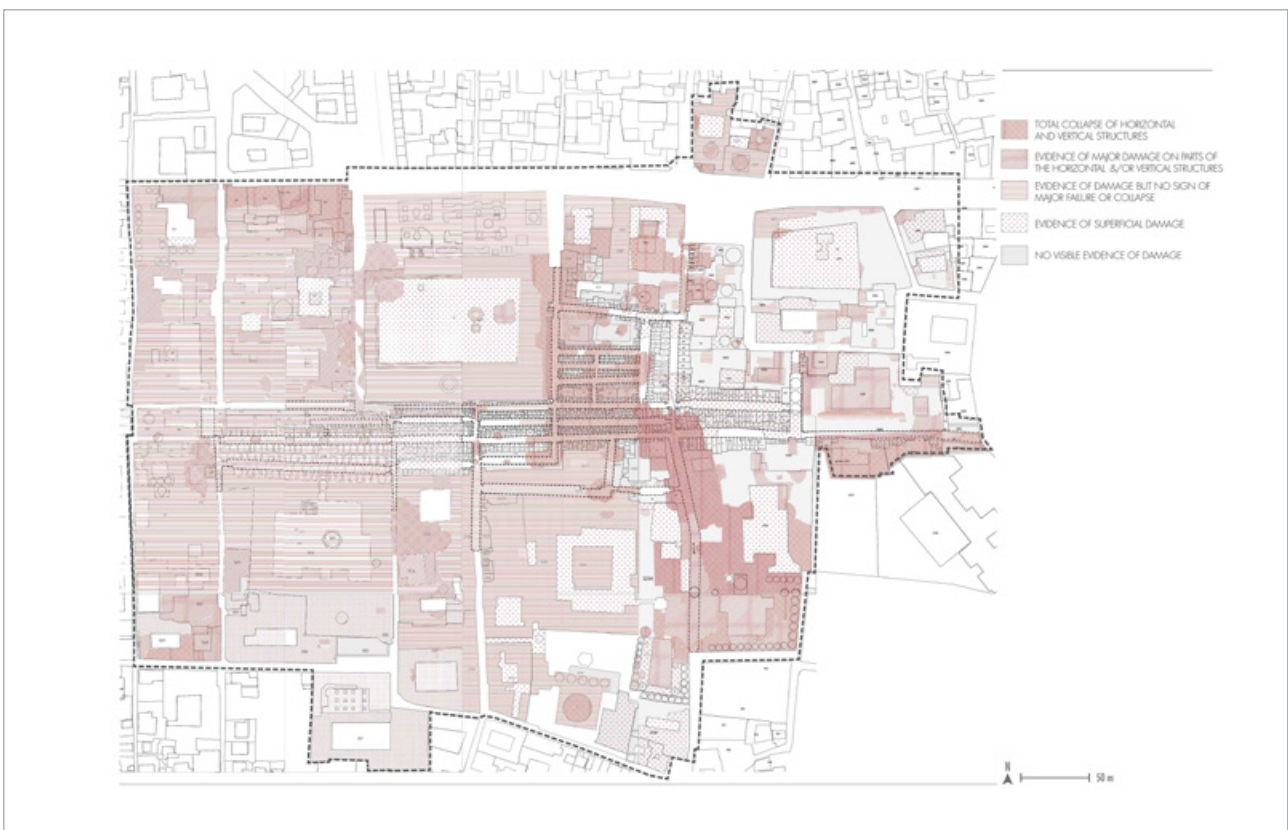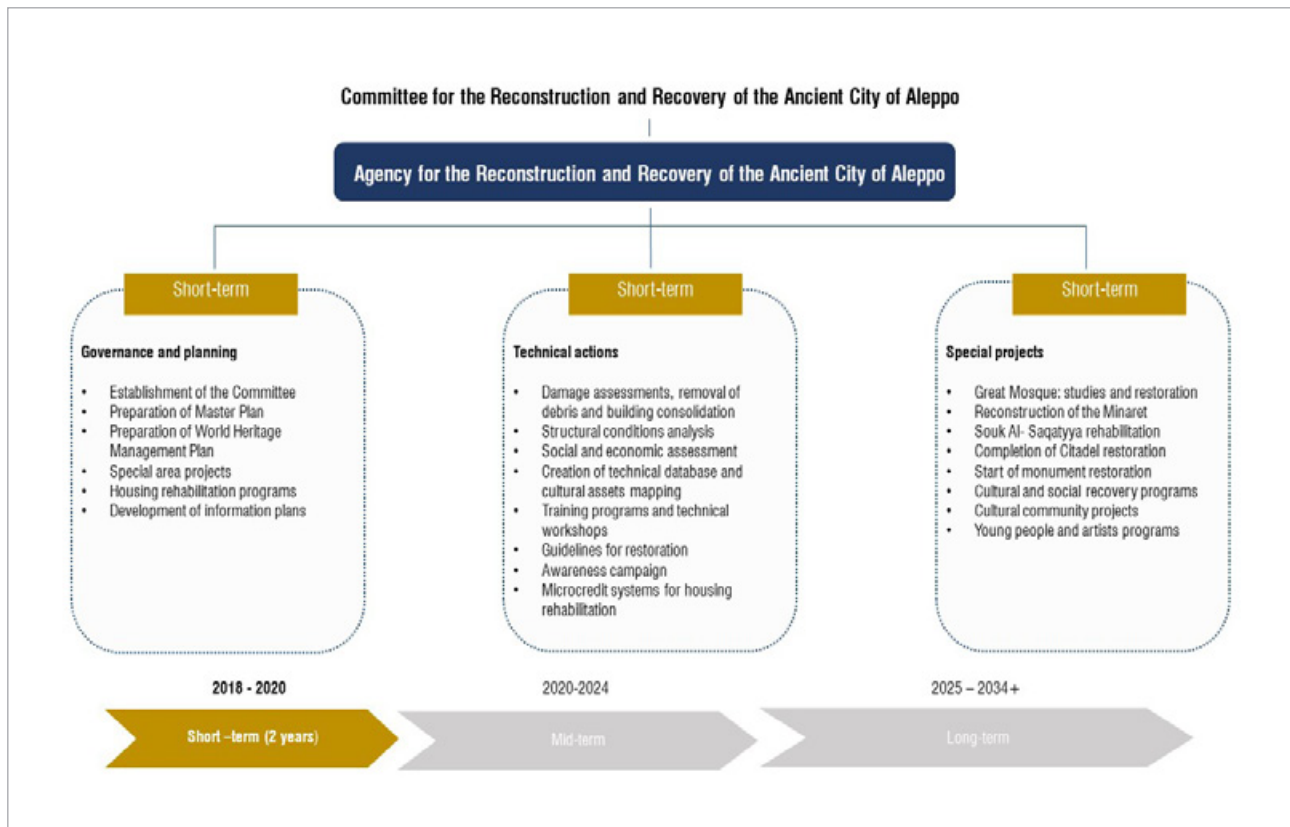

Fig. 4. The Central Commercial Zone: the levels of damage based on the assessment carried out by AKTC in 2017, (courtesy of AKTC)

The meeting aimed at estimating, based on available damage assessments and analyses, the needs in terms of traditional building materials and techniques and taking stock of the remaining craftsmen. After the meeting, a training workshop was conducted in the citadel by AKTC, in collaboration with DGAM, STD, and UNESCO, for stonemasons with the aim of engaging them in the future restoration works (DGAM 2018a: 16–17). During the workshop, the trainees contributed to the restoration of some structures in the citadel including the Ottoman windmill and the Ayyubid Royal Palace. In addition, training seminars on stone building and restoration techniques were conducted for local architects, engineers and other professionals.

Parallel to these actions, the Steering Committee worked on preparing a strategy for the recovery process of Aleppo. This strategy was issued as "The Reconstruction and Recovery of the World Heritage City of Aleppo: Vision and Planning Framework" in October 2018. The strategy: 1) envisioned a new and appropriate governance structure that can effectively manage the recovery process, 2) addressed the necessary planning frameworks that will be the basic tool to recognise the needs and facilitate the recovery process, 3) gave insights on the building of new operational and financial tools to support and promote the recovery process. In doing so, reference was made to the approach proposed by the 2011 UNESCO Recommendation on the Historic Urban Landscape and the previous international recovery experiences. The strategy acknowledged that the recovery of the historic city will overlap with those of the wider metropolis, referred to as "Greater Aleppo", and will require a joint approach. The strategy also acknowledged that the recovery process will require many years of work. Therefore, it established a timeline which consists of three phases: short-term (2018–2020), mid-term (2020–2024) and long term (2025–2034+) for all the activities to be implemented (fig. 5). Once the recovery process has advanced, the Universal Outstanding Value of the World Heritage property has to be reassessed and a Management Plan has to be prepared to address the practices needed to preserve this value.
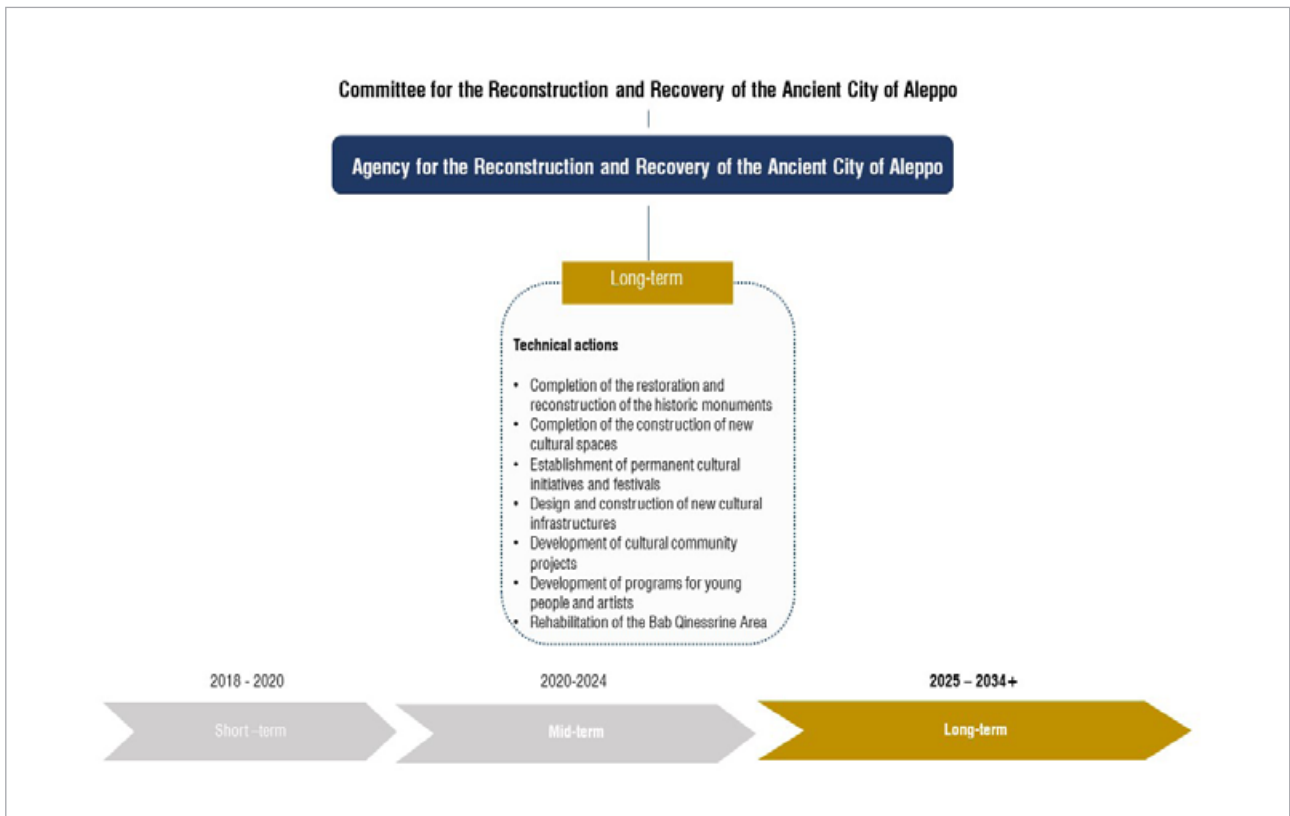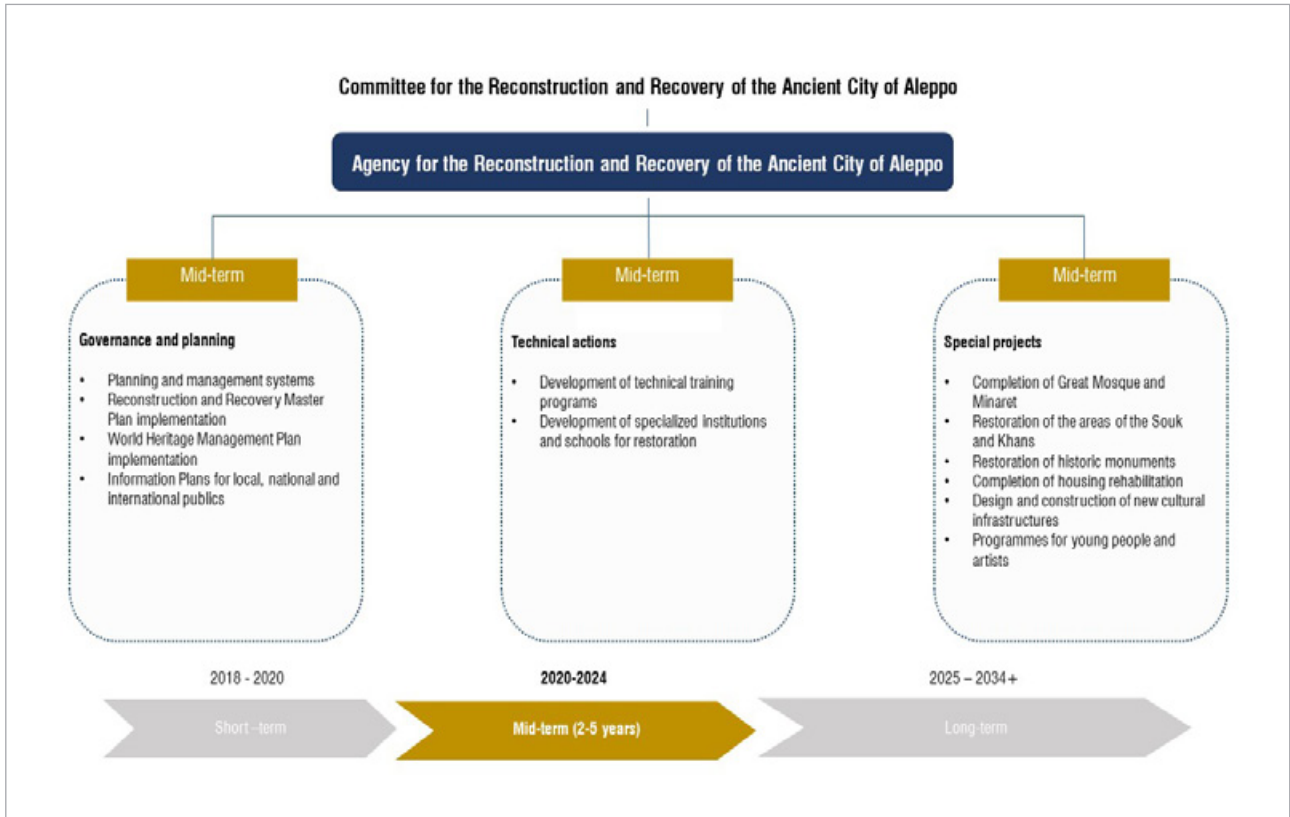

Committee for the Reconstruction and Recovery of the Ancient City of Aleppo

Agency for the Reconstruction and Recovery of the Ancient City of Aleppo

Short-term	Short-term	Short-term
Governance and planning	**Technical actions**	**Special projects**
• Establishment of the Committee • Preparation of Master Plan • Preparation of World Heritage Management Plan • Special area projects • Housing rehabilitation programs • Development of information plans	• Damage assessments, removal of debris and building consolidation • Structural conditions analysis • Social and economic assessment • Creation of technical database and cultural assets mapping • Training programs and technical workshops • Guidelines for restoration • Awareness campaign • Microcredit systems for housing rehabilitation	• Great Mosque: studies and restoration • Reconstruction of the Minaret • Souk Al- Saqatyya rehabilitation • Completion of Citadel restoration • Start of monument restoration • Cultural and social recovery programs • Cultural community projects • Young people and artists programs
2018 - 2020	**2020-2024**	**2025 – 2034+**
Short –term (2 years)	Mid-term	Long-term

Fig. 5. The timeframe of the Reconstruction and Recovery Process of the Ancient City of Aleppo, a) the short term, b) the mid-term and c) the long term, (courtesy of DGAM)

Within the new governance framework, a general committee (the Recovery Committee) and a specialised agency (the Recovery Agency) for the Reconstruction and Recovery of the Ancient City of Aleppo were established. The Recovery Committee includes the key actors in the recovery process, i.e. the national and local authorities as well as other significant national and international partners. Its main task is to coordinate all the future interventions in the historic urban area as well as to generate consensus among the different stakeholders on the priorities and on the key decisions. The Recovery Agency, on the other side, is based on a collaborative framework among the technical bodies including The Directorate General for Antiquities and Museums, The Directorate for the Old City of Aleppo, The Syria Trust for Development and The Aga Khan Trust for Culture. The main task of the agency is to coordinate and execute all the necessary actions, to provide the Recovery Committee with the information and to report on the advancement of the recovery process (DGAM 2018b: 21-23).

As for the planning framework, the strategy has highlighted the "Recovery Master Plan" as the main guiding tool for all the activities to be implemented. The plan will be prepared and implemented by the newly established Recovery Agency and will address the civic participation, the reconstruction activities, the regulatory processes, and the building laws in order to facilitate the recovery works (DGAM 2018b: 21-23). However, due to the constraints and the complexity of this task, the strategy has noted that the implementation of the Master Plan will be done, in short- and mid-term phases, through Special Area Plans of intervention. These plans will provide a booster for the reconstruction and recovery process of the entire city and will allow the implementation of interventions that can be later replicated by other stakeholders. After the Recovery Master Plan is completed and activated, the Special Area Plans can be applied when the condition will require highly specialised technical aids (DGAM 2018b: 21–23).

The special area plans that were identified in the short and mid-term phases have already witnessed some urgent interventions and initial assessments. Their selection was derived from their symbolic and significant role in the life of the local community. Thus,

their reconstruction can strengthen the local spirit and accelerate the recovery of the city. The two plans closely relating to the case study are:

1. The restoration of the Great Umayyad Mosque and reconstruction of its minaret

Soon after the conflict, DGAM and the General Directorate of Islamic Endowments (AWQAF) provided protective measures at the site such as safeguarding the building, cleaning the debris, collecting and ordering the remains and constructing urgent scaffoldings. A fund was donated by the Chechen Republic to support the restoration study which was prepared by professors from Aleppo University and the implementation which is currently supervised and conducted by local experts and staff. The restoration study and works started at the end of 2018 and will continue till the end of the mid-term phase.

2. The reconstruction and rehabilitation of the *suqs* in the central commercial zone

As explained before, the central commercial zone is an urban core consisting of a network of historic *suqs* and commercial facilities in addition to numerous monuments and traditional public buildings. Therefore, the zone should be reconstructed and rehabilitated as a historic urban landscape in line with the standards required in the World Heritage Sites. Within this framework, priority was given to the *suqs* as they are the arteries connecting the different sections of the zone, the major urban hub for locals and their restoration and rehabilitation would speed the recovery of the economic activities within the zone.

In response to the special plan of reconstruction and rehabilitation of the central *suqs*, AKTC donated a fund to prepare the required studies to restore a section of the *suqs* and to provide technical supervision in collaboration with the DGAM staff. In the light of all the constraints mentioned previously, it was necessary to divide the work into several phases of implementation and to start with a pilot project through which the level of coordination and management can be examined. *Suq* al-Saqatiyya was chosen for this purpose taking into consideration several points such as its central location

within the urban fabric of the commercial zone which allows a balanced extension of future restoration and reconstruction works in the surrounding *suqs*, its function which is directly related with the daily local needs of Aleppo's inhabitants, its stylistic unity which decreases the time needed for the restoration study compared with some other *suqs* that incorporate different historic layers and building techniques, and finally its moderate rate of damage which decreases the time needed for implementation.

4. Response Actions, Timeframes, Resources and Costs

Soon after a memorandum of understanding was signed between the Agency of Recovery and AKTC, the staff of the latter started with the documentation of the *suq* in order to assess the damage and decide the suitable interventions. The documentation included historical and archival research, architectural survey, 3D modelling, photographing and field inspections (fig. 6). The results of the documentation showed the following:

1) A partial destruction of some structural elements: Three of the four domes that are covering the main passage of the *suq* were affected by shells and partly destroyed. In two domes, the destruction was limited to some sections of the domes themselves, while in the third dome the destruction incorporated also a section of the supporting walls and the pendentives. In addition, some points in the upper roof were affected where sections of the stone vaults and the covering concrete screed were destroyed. Finally, the western entrance of the *suq* was heavily damaged. The vault, the arch of the entrance and some sections of its walls were destroyed or disintegrated.

2) Multiple levels of deterioration of building materials and architectural elements: Some of the deteriorations were caused by the conflict while others resulted from the lack of maintenance or incompatible interventions and additions. The stone surfaces were dirty and full of holes and bullet traces. Some stones were severely cracked. The plasters and mortars were worn and loose. The wooden gates of the *suq* were very dilapidated. The covering screeds of the upper roof were cracked.
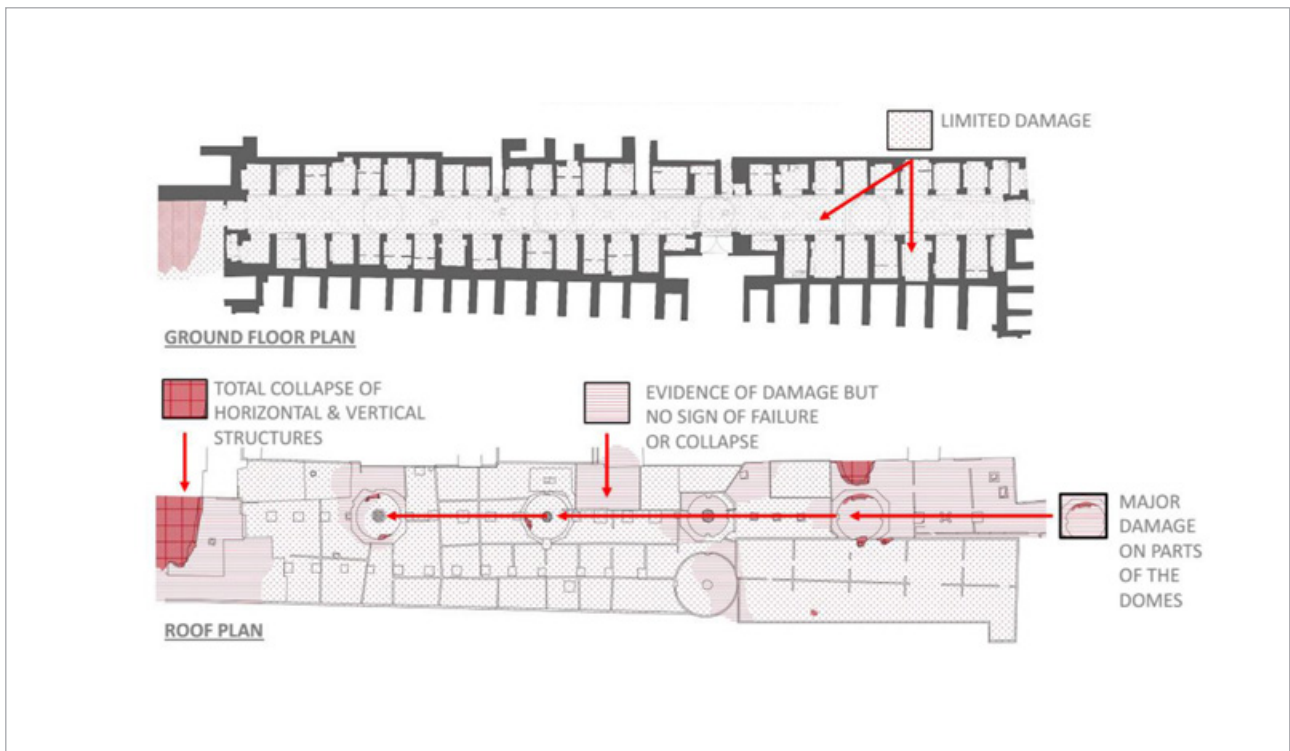
Fig. 6. A sample of the damage assessment surveys of Suq al-Saqatiyya, (courtesy of AKTC)

3) An excessive usage of new cladding materials and architectural elements: Over the years, the shopkeepers have conducted several interventions to renovate their shops and adapt them to their needs. Every shop had a different type of new shutters, shopfront, sign, and claddings. Some of these interventions have caused physical damage to the original building materials while others have degraded the historic and architectural value of the *suq*.

4) Poor infrastructure and random installation of the service networks.

5) Parallel to the documentation work, the Syrian Trust for Development (STD), in collaboration with Aleppo Governorate and Chamber of Commerce, initiated a series of meetings with the shopkeepers to explain the project, listen to their concerns and needs, and accordingly assist them to restore their shops. It was found that some of the shopkeepers had moved out either to other cities in Syria or abroad. As they have already established works there, some of these shopkeepers do not plan to come back before the socioeconomic condition is settled and recovered. The ones who were in the city expressed concern about the high cost of works in the light of the high prices of building materials and the shortage of some. They were also worried that they would not benefit after re-opening their shops as the historical commercial centre is still not functioning and the economic condition is insecure. Their other concern were the complicated procedures for obtaining the required permits. This was particularly applicable to the butchers and restaurants who need to meet both the requirements of the General Health Department and the Directorate of the Old City at the same time. Even after obtaining the permits, they were not sure whether or they could implement the works as required. Regarding the requests, the shopkeepers asked for the infrastructure of the *suq* to be upgraded and their shops to be provided with all needed services (electricity, water, telephone, ventilation, fire, etc.). They specifically requested an efficient alarm system as the *suq* will be the first to function and there will not be enough security.

In response to the results of the documentation works and the meetings with the shopkeepers, DGAM, AKTC and STD decided the following:

1) The common spaces of the *suq* (the main passage, the entrances, and the upper roof) will be restored by AKTC under the supervision of DGAM and DOC. The works will include the reconstruction of the destroyed elements, the restoration of the damaged materials and architectural elements, the removal of the new shopfronts and any additions on the façades of the main passage and replacing them with new ones that respect the historical and architectural values of the *suq*. The designs and materials of the new elements will be discussed with shopkeepers and the supervising departments. These works will be totally funded by AKTC.

2) The infrastructure and service networks will be upgraded by AKTC in collaboration with the Department of Technical Services under the supervision of DGAM. These works will be funded by AKTC.

3) The restoration of the shop interiors will be left to their owners under the supervision of DGAM and DOC. STD will help the shopkeepers to obtain the required permits and provide financial subsidies for those who prove they cannot afford the restoration costs. On the other side, AKTC will choose some shops that exhibit a wide range of problems and restore them as models for other shops to follow. It will also provide technical assistance to the shopkeepers wherever needed.

4) With all data gathered and decisions taken, the staff of the AKTC built a Historical Building Information Modelling (HBIM) and prepared the restoration project of the *suq* with all the proposed works and technical specifications (fig. 7). The work was assigned to a local specialised contractor who had previously worked on several projects with AKTC in order to guarantee the quality of the implementation. The size of the necessary works was manageable and thus the problem of the shortage of workers and building materials, which is still one of the main challenges facing the restoration projects in the Old City, could be solved. The workers, about 60 persons, were all locals. Some of them had been previously trained in workshops conducted by AKTC while others had worked with the contractor on previous
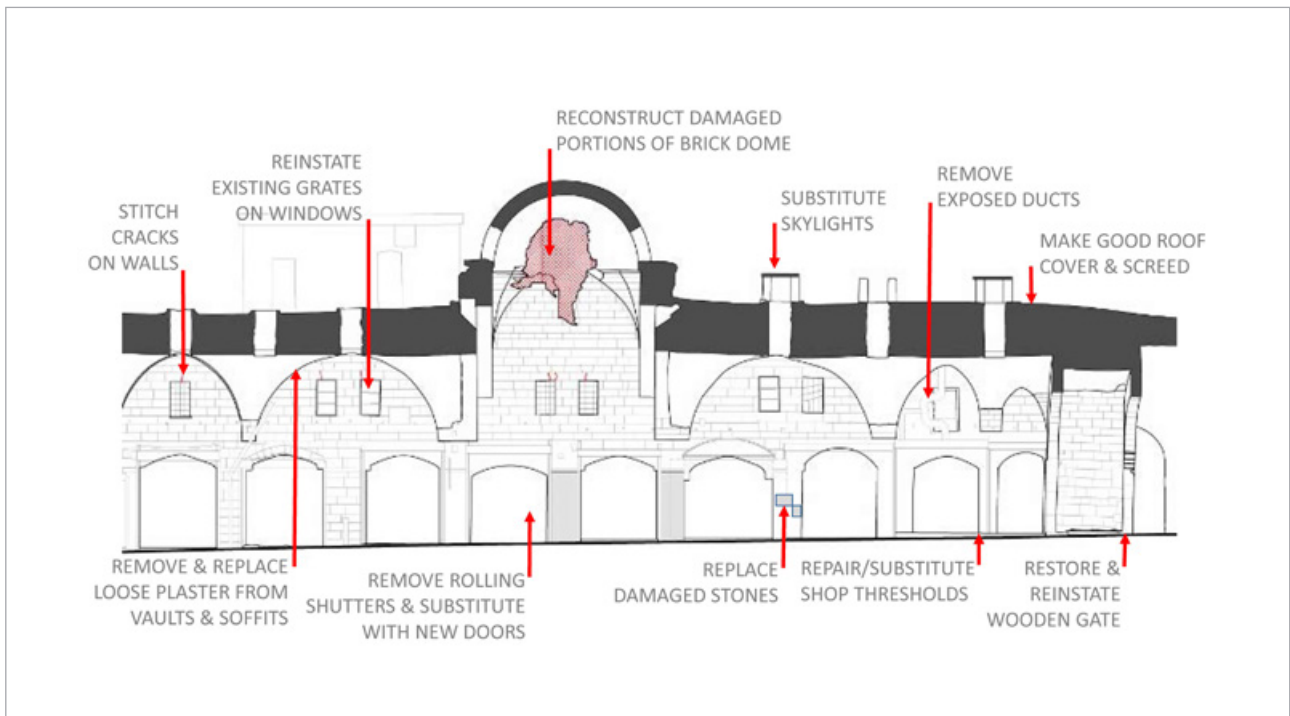
**Fig. 7.** A sample of the proposed interventions in Suq al-Saqatiyya, (courtesy of AKTC)

projects. The necessary building materials could be provided, yet at high prices, after several spots of the surrounding rural settlements became secure. Stone and lime were provided from the countryside while the brick blocks were fabricated and supplied from the province of Hama.

5) The implementation started on 1 November 2018. To ensure the smooth flow of the works, the project was divided into five intersected parts; 1) The works of the main passage, 2) The infrastructure works, 3) The works of the upper roof, 4) The works of two model shops, and finally 5) The lighting and power supply system. As in any other project, the works of the five parts overlapped. However, it will be grouped under main categories for the sake of easier presentation.

   a. *Preparing the site:* The works started with cleaning the debris and sorting the dismantled original stones and bricks that could be reused in the reconstruction. Necessary scaffolding to support the destroyed and disintegrated sections was installed (fig. 8). The cleaning works continued with removal of all the new cladding materials, elements,

and installations and handing them to their owners (fig. 9). Within this phase, some of the upper windows that had been blocked up were re-opened after negotiations with the shopkeepers. The worn joints were purged and the cracking screeds of the upper roof and the flaking plasters were removed (fig. 10). The removal works were done manually as much as possible to minimise additional damage to the original materials.

   b. *Reconstructing the destroyed sections:* The destroyed sections were rebuilt following the traditional local techniques and using the remaining usable materials in addition to new ones when needed. The new bricks were fabricated following the same dimensions and specifications of the original ones. The stone blocks were chosen to be as geologically similar to the original ones as far as possible. They were dressed using the same traditional tools and techniques. One of the partially destroyed domes was completely dismantled and rebuilt together with destroyed sections of its supporting walls and pendentives in order to ensure its structural stability (fig. 11).
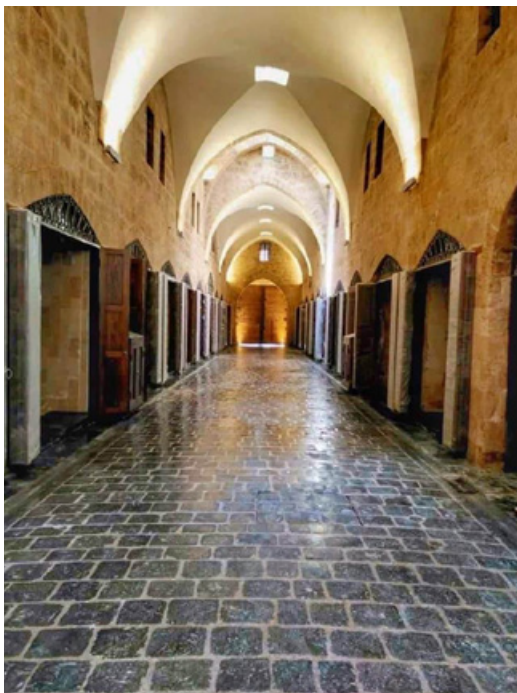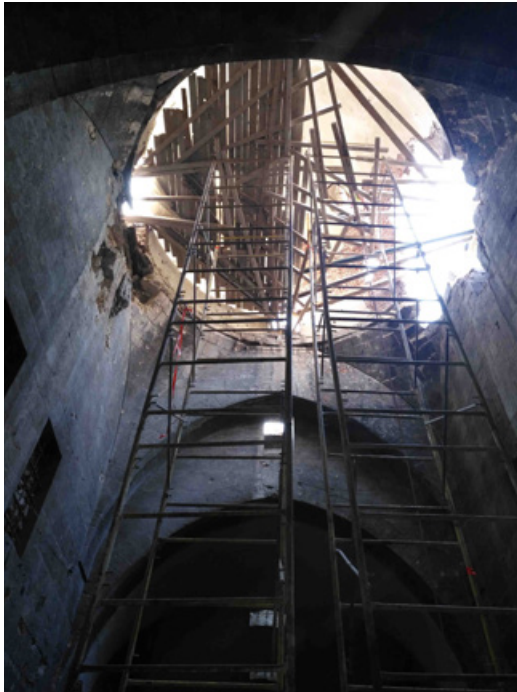
Images, Clockwise from top left:

Fig. 8. The installation of support scaffolding for the destroyed and disintegrated sections, (courtesy of DGAM)

Fig. 9. The removal of new claddings and incompatible elements, (courtesy of DGAM)

Fig. 10. The removal of worn joints and plasters, (courtesy of DGAM)

Fig. 11. One dome after dismantling, (courtesy of DGAM)

Fig. 12. A general view of the central passage of the suq after restoration, (courtesy of DGAM)

c. *Restoration works:* The works were limited to the necessary interventions and used traditional techniques and materials as much as possible. The damaged stones were restored using different techniques as needed including filling the holes with rubble and lime-based mortar, reinstalling the detached parts using stainless steel pins and adhesive materials, and injecting fragile blocks with lime water. Only a few severely damaged and irreparable blocks were replaced by new ones. The stone surfaces were also cleaned gently using water and fine brushes. The stones bearing decorative carvings were repaired by patching with resins, cleaned with poultices of water and suitable solvents and then consolidated by injecting lime water. Lime-based traditional mixtures were used to grout the cracks, point the open joints and plaster the domes and vaults (fig. 12). The wooden gates of the *suq* were restored and re-installed to their original positions under the close supervision of DGAM staff (fig. 13).

d. *Renovation works:* These works were limited to the shops and implemented once agreement was reached between the shopkeepers and DGAM staff on the materials and designs. Regarding the shop façades overlooking the main passage, new wooden shutters of neutral designs were installed and the concrete thresholds were replaced by new ones of basalt stone similar to the original pavement of the *suq* (fig. 14). Regarding the shop interiors, several alternatives of possible claddings and equipment were proposed to the shopkeepers. In the shops that are dealing with butchery, the walls can be covered with cladding stone or marble to meet the requirement of the Health Department while in other shops the squared stones of the walls can be plastered or left without any covering. One of the two model shops that was restored by AKTC was equipped with a fixed table with a marble surface and the other with wooden partitions and cupboards according to the requests of their owners.

e. *Infrastructure and technical services:* After several meetings with the shopkeepers and the technical departments concerned, the decision was taken

to provide every shop with a technical shaft that is hidden in the thickness of the walls and continues from the ground floor to the upper roof. Also, the distribution boxes (electricity, telephone, fire, alarm and solar-energy supplying system) were placed within recesses created inside the stone walls and the wiring was hidden under floor pavements. The drainage system in the upper roofs and in the main passage was completely renovated (fig. 15).

The continuous and effective coordination made it possible to finish the project within the planned time frame which was set as 11 months and the allocated budget which was around US$450,000. After completion, a maintenance manual was prepared and delivered to DGAM and the shopkeepers to ensure the quality of any future repairs or interventions. However, the official reports of the project have not been published or circulated among the professionals working in the Old City.

As already explained, the project left the restoration of the shops to their owners. Till now, thirty-three shops have been restored including those restored by AKTC as models. STD has helped the shopkeepers of these shops to obtain the official ownership papers and required permits. It has also provided a financial aid of SP2,000,000 to help eleven shopkeepers cover the costs of restoration. AKTC has also contributed by providing the necessary traditional building materials and the technical assistance when needed. In fact, seventeen shopkeepers have contracted the same contractor and workmen who were working on the project to conduct the restoration works of their shops. This was a positive factor that enhanced the overall quality of the works and the architectural integrity of the *suq*.

Having completed the pilot project of *Suq* al-Saqatiyya, AKTC staff began the western extension of the project to re-establish the traditional connection from the *suq* towards the north. Works are currently taking place in *Suq* Khan al-Harir and *Suq* Abrak. The STD, using the experience gained from the pilot project, is still working to mobilise funds and assist shopkeepers in restoring their shops. On a wider scope, the Recovery Agency is developing a plan for the social and economic rehabilitation of the historic *suqs* based on the results of need assessments.

Images, Clockwise from top left:
Fig. 13. The western wooden door of the suq before and after restoration, (courtesy of DGAM)
Fig. 14. One of the shops after restoration, (courtesy of DGAM)
Fig. 15. A general view of the upper roof before and after restoration, (courtesy of DGAM)

5. The Outcomes and Effects

So, what has been achieved? A single *suq* which is located amid a network of historical *suqs* and was moderately damaged has been physically restored in a way that respected its historical and architectural values within the planned time frame and the allocated budget. From its fifty-three shops, thirty-three have been restored and put again to serve their original functions. However, the *suq* has not yet regained its full socioeconomic activity for different reasons. The historical commercial zone has lost a considerable portion of their clients; namely, the people who used to come from the towns and villages, people from the severely destructed neighbourhoods in the Old City, and tourists. Many shopkeepers and business owners are either out of the city or cannot afford the costs of re-opening their works without guarantees or incentives. Wide sections of the zone are still under restoration while others are still in ruins. Therefore, it can be said that the tangible values of *Suq* al-Saqatiyya were restored while the intangible ones, the economic activity and social spirit, are still questionable. In any case, *Suq* al-Saqatiyya has gained a new symbolic value being the first project accomplished within the post-war recovery process of Aleppo and this will always be a point to be remembered in future scholarly literature.

Before evaluating the outcomes of the rehabilitation project of *Suq* al-Saqatiyya, it is important to remember that it was only a pilot project chosen according to specific criteria to examine the ability of the different stakeholders to coordinate and adopt a participatory approach within the context of the numerous constraints of the recovery process. These constraints have been discussed in the Recovery Strategy. They will necessitate long-term and wide-scope governmental actions before they are fully solved; a matter which is beyond the scope of a single project. Having said this, the evaluation of the project will be done firstly through presenting and discussing the different local responses after its inauguration and secondly through pointing out the factors that played a role in its successful implementation and comparing it with the other restoration projects that are currently taking place in the historic *suqs*.

In general, the inauguration of the project was received positively by the public who considered it a first step in the recovery of the central commercial zone and the Old City. Some were very optimistic envisioning, smooth and rapid steps, while others had more realistic expectations and considered the project as one successful step in a tedious and long process. On the other side, some of the responses were critical of the process. Some people criticised the fact that *Suq* al-Saqatiyya was prioritised over the seriously damaged *suqs* or those that had been destroyed and described it as a <<shiny bride at a funeral>>. Some other critics were technical. Some people argued that vaults should not be plastered because there are several old photos of the *suqs* showing the roofing vaults without plaster. Some others criticised the decision to unify the shopfronts arguing that the old *suqs* were always famous for the rich variety of the architectural elements. Finally, some people criticised the large size of the solar-energy units that have been installed on the upper roof arguing that it will disturb the general view of the roofs of the central commercial zone if they are installed for every *suq*.

These negative responses, pointed to the lack of communication with the public and the promotion of the project, its context, its objectives, and its implementation. The Recovery Strategy was indeed presented in Aleppo for the departments, stakeholders and specialists concerned, but it has not been yet presented to the public or discussed with them. Specifically, it seems that the special plan for the "the reconstruction and rehabilitation of the *suqs* in the central commercial zone" and its successive phases were inadequately explained. Maybe this could be justified in the case of *Suq* al-Saqatiyya because there was a need to rush and to experiment with the tools available. However, the following steps should be discussed thoroughly with the local community which will open the chance to exchange the expectations, needs and visions. On the other side, the technical negative responses, whether they have valid arguments or not, are an indicator that the project has succeeded in creating an impact among the professionals. This emphasises the need to publish the technical report of the project which explains the decisions that were taken, the techniques that were applied and the challenges that were met. Every detail should be discussed so that good practices can be spread and wrong practices avoided in future projects.

When compared to the other restoration projects that are currently taking place in the historical *suqs*, the following success factors can be highlighted:

1) On the regulatory level, the decision that has been taken by STD to help the shopkeepers in obtaining the required permits proved to be one of the most important factors that facilitated the project. On one side, the shopkeepers were relieved of a complicated procedure which hinders many of the owners from restoring their shops and on the other side it allowed a homogeneous implementation of the works in terms of the building materials and techniques used, and the new additions and services installed. Unfortunately, this could not be achieved in many other restorations where separate individual permits are given to the shops that are located within one *suq* without taking into consideration the historical, architectural and physical integrity of the *suq*. In this context, it should be also mentioned that the building codes and regulatory tools that currently control the interventions in the Old City are the same as which were applied before the war without any modifications.

2) It is undeniable that the project team succeeded in building full coordination among the shopkeepers, the heritage authorities, and the other departments concerned. The regular meetings have engaged the shopkeepers in all the phases. Their requests and needs were taken into consideration and affected the interventions in some cases as was shown previously. This approach has motivated the shopkeepers to restore their units and increased their sense of common responsibility. Here, it is worth mentioning that the feedback from the shopkeepers after the project was completed was totally positive. However, this level of coordination is still lacking in some other restoration projects.

3) Another success factor of the project was the high quality of the restoration study that was prepared by experienced specialists. This sheds light on the capacity building programmes and their content. Till now, most of the programmes offered focused on the implementation techniques. They ranged from workshops of traditional building materials and techniques targeting craftsmen to training

courses on structural interventions targeting heritage professionals. Needless to say, while these topics are extremely important; there is nevertheless a critical shortage of architects who can prepare a full restoration study according to international standards. The majority of the local architects and engineers have not been fully introduced to the international concepts and principals of conservation and are thus incapable of making correct decisions regarding the optimal level of intervention or suitable techniques. It is also mentioning that up to now there is neither an academic programme nor a department of restoration at Aleppo University nor public or private vocational schools in this field.

4) *The efficient supervision of the implementation both from the AKTC, DGAM, and DOC staff*. This also sheds light on the shortage of DGAM staff (both quantitatively and qualitatively) that is able to supervise all the projects currently being implemented in the Old City which creates delays and sometime inappropriate implementations.

5) *The high quality of the implemented works compared to other projects*. This was because of the technical specifications that have been developed over the years through the previous work in Aleppo and the know-how/best practice with stones, mortars, plasters, wood, etc. For sustainable results, these specifications should be published and circulated among the specialists and professionals working in the Old City. In the longer term, these specifications together with the ones gained from other projects can be prepared in the formats of manuals or technical guidelines that can ensure the quality of all the interventions in the Old City.

6. Additional Comments

The *Suq* al-Saqatiyya project has proved that despite all constraints, it is possible to successfully conduct medium-sized and low-budget projects in the short-term phase once the coordination among all concern stakeholders is fully efficient. To ensure sustainable outcomes, the initiatives that were followed in this project and proved to be effective should be adopted

by the Recovery Agency and formulated into tools and mechanisms that can help in facilitating the recovery activities in the mid- and long-term phases. Once this is achieved, we can say that the *Suq* al-Saqatiyya project has succeeded to in meeting its main objective as a pilot project.

As already mentioned, the Recovery Agency is now developing a plan to revitalise the economy and social life in historic *suqs*. This plan should emphasise the functions that meet the direct needs of the remaining population of the city in the short term. This can be somewhat challenging because while a large portion of this population lives in the metropolitan city, it was not the main daily client of the historic *suqs* but rather a seasonal one. The main clients would be expected to come back in the long term after the reconstruction of the damaged neighbourhoods, the securing and rehabilitating of the nearby towns and villages, and the revival of domestic and international tourism. In doing so, priority should be given to the works run by individuals and micro-sized enterprises, and legal, regulatory, financial and technical incentive packages should be offered. Nonetheless, it should be expected that some work owners and shopkeepers will not come back before the economy of the city is considerably revived. Unfortunately, the available data is still inadequate to fully understand the impacts of the conflict on the social and economic life of the city and consequently on its tangible and intangible cultural heritage. Therefore, it is now a paramount priority for the Recovery Agency to complete the mapping and the evaluation of the need assessments to accomplish the Recovery Master Plan and direct both the national and international efforts and contributions. Here, it is worth mentioning that cost estimates prepared for the recovery of the central commercial zone were limited only to the restoration and reconstruction of the physical structures. Indeed, additional investments will be necessary to rehabilitate the zone; however, these costs cannot be estimated right now.

The Recovery of the Old City of Aleppo is undoubtedly a major challenge for the Syrian people and government. the Recovery Committee has to coordinate the restoration of the monuments, the rebuilding of the urban fabric, as well as the regeneration of the social and economic life within the constraints of attracting funds,

mobilising local capital, and developing the necessary tools. A positive point that can always be the main motivator during this process is the shared values the Aleppines have for their heritage. It is true that during the war, there was an ongoing argument among people concerning the prioritisation between the humanitarian loss and the historical loss. Even now, people still argue over the prioritisation of the cultural heritage among the other urgent needs. However, the tangible and intangible heritage that has been accumulated during the ages of mutual living and tolerance is still a source of pride to any Aleppine regardless of the political view or the current place of residency. This shared and collective appreciation has become stronger after the devastating damage to the city's cultural assets. The issue of prioritisation can be solved by placing culture at the core of the recovery process and engaging the local community in all of its phases. There is a hope among many experts involved in the process that the Outstanding Universal Value of the Ancient City of Aleppo as a diverse, open and culturally rich city can be largely recovered in the years to come.

7. Details of the Expert(s) completing the Case Study

Ruba Kasmo, Arch., PhD, is an architect specialised in the conservation of cultural heritage and the history of Islamic architecture with a special emphasis on Syria and the Arab region. Between 2001 and 2005, she participated in training and voluntary activities coordinated by the Rehabilitation project of the Old City of Aleppo and worked on the AKTC-DGAM Conservation project of the Citadel of Aleppo. She participated in research projects on the cultural heritage of Aleppo in collaboration with IRCICA (2013–2017), UNESCO-WHC (2015–2017), and the Museum of Islamic Arts in Berlin (2018–present). She was a member of the UNESCO-UNITAR-UNOSAT joint international team on assessing the damages to the cultural heritage in the Old City of Aleppo during the years of the conflict.

Ruba Kasmo holds a BSc in Architectural Engineering and an MA in the History of Architecture from Aleppo University, and an MSc and PhD. in Architectural and Urban Conservation from Istanbul Technical University.

Her doctoral dissertation examined the conservation problems of the central commercial zone of the Old City of Aleppo and its khans. Currently, she is an assistant professor affiliated with the Department of Architecture, Fatih Sultan Mehmet Waqf University in Istanbul.

Lina Kutiefan, Arch. has worked in the Directorate General of Antiquities & Museums (DGAM) in Syria since 1989. She was a Site Manager of several restoration projects in Tekkiye Salimya and Damascus Citadel. In 2001, she worked as deputy director of the Historical Monuments and Documentation department and was one of the team responsible for the registration files on the World Heritage Lists (Crac des Chevaliers and Qal'at Salah El-Din – 2006 and Ancient Villages of Northern Syria – 2011). In 2007, she was appointed as Director of the Syrian World Heritage Sites in DGAM, during the Syrian crisis, she was responsible for assessing the damage in the World Heritage Sites including Aleppo Ancient City. She was a coordinator for the damage assessment project financed by UNESCO in Aleppo in 2017.

She has been a Consultant Architect at the Syrian Engineers Syndicate since 2011, a member of ICOMOS since 2014 and focal point in DGAM for the UNESCO World Heritage Convention 1972. She holds a BA in Architecture from Damascus University, and is now a PhD student in Pázmány Péter Catholic University – faculty of History – in Budapest.

Notes

[1] A local pronunciation derived from Al Madinah (the city). This local term reflects the importance of the commercial zone and its vital role in the life of the local community. It was a city inside a city.

[2] The khans are multifunctional buildings serving as warehouses, places for commercial transactions and brief stay for travelling merchants. Generally, the plan of the khans has not varied in the course of time nor has their functions. They usually comprise rooms on the ground floor for storing goods and rooms upstairs for the merchants' lodgings, all arranged around a courtyard. The flourishing of long-distance trade and the commercial capitulations granted to Europeans caused a substantial increase in the number of foreigners in Aleppo starting from the early sixteenth-century. Most of the merchants, consulates and religious missionaries were accommodated in the khans.

[3] The *qaysariyya* is a type of commercial building that acquired different functions and designs over the centuries. In the medieval historic accounts of Aleppo, the term was used to describe *suqs*. From the descriptions, it seems that there were two forms of *qaysariyyas*. The first one was reserved for valuable goods and consisted of shops arranged around a central courtyard, while the second one had a linear design. Those *qaysariyyas* may be distinguished from the ordinary *suqs* by their greater size and by their several covered passages, while the *suqs* consisted only of a single passage. In the sixteenth-century, the *qaysariyyas* acquired a manufacturing function and were located close to the *khans* or *suqs* that deal with the same products. Some of those *qaysariyyas* were free-standing structures taking the form of miniature khans while others were embedded in grand khans and *suqs*. They were situated on in the upper floors and took the form of distributive corridors giving way to small cells on either side. The manufacturing function of the *qaysariyyas* developed considerably during the seventeenth and eighteenth centuries, so they became large structures enclosing vast workshops and in some cases providing cheap and modest lodging for workers.

[4] Born in Bosnia, Sokullu Mehmed Pasha (1505-79) was one of the famous Ottoman Grand Viziers and the only one to have held this position uninterruptedly under three successive sultans, Suleiman, Selim II, and Murad III, from 1565 to 1579. Sokullu Pasha established numerous pious foundations in Istanbul and all across the empire. His building campaign in Aleppo encompassed many structures in different locations. Considerable numbers of these structures have been demolished due to the urban interventions in the twentieth-century, however; his monumental buildings in the central commercial zone have survived and are considered valuable examples of the civic commercial architecture in the city.

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NEW APPROACHES FOR REBUILDING AND PRESERVING RURAL HERITAGE: THE CASE OF SAN PEDRO DE ALCÁNTARA, O'HIGGINS REGION, CHILE

Maria de los Angeles Muñoz Martinez

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List of Acronyms

CMN	National Monuments Council *(Consejo de Monumentos Nacionales)*
INE	Institute of National Statistics *(Instituto Nacional de Estadísticas)*
MBN	Ministry of National Assets *(Ministerio de Bienes Nacionales)*
MINVU	Ministry of Housing and Urban Development *(Ministerio de Vivienda y Urbanismo)*
SERVIU	Housing and Urban Development Service *(Servicio de Vivienda y Urbanismo)*
SEREMI	Housing Ministry's Regional Secretariat *(Secretaría Regional Ministerial de Vivienda)*

Acknowledgments

1. The Heritage Resource and Its Context Before the Impacting Event(s)

1.1 Description, Designation and Recognition

San Pedro de Alcántara is a Chilean town, located 155 miles south-west of Santiago, on the coastal dry lands of the O'Higgins Region, where the coastal mountain range meets the central valley (fig. 1). It is part of the Paredones commune, and according to data from the 2017 census, it has a population of 1,341 inhabitants. Of that total, 19.1 per cent is over 65 years of age, surpassing the national average of 11.4 per cent (Instituto Nacional de Estadísticas 2018a).

The main street is San Francisco Street (fig. 2), around which the ten blocks that make up the town are organised, following the topography of the land (Consejo de Monumentos Nacionales 2011). The existing buildings are arranged according to an octagonal or checkerboard plan, which gives the town a uniform and continuous image, typical of the rural areas of the central valley of Chile.

▶
From top to bottom:
Fig. 1. Aerial view of San Pedro de Alcántara, and location of Paredones in the O'Higgins Region and in Chile. (Author, Wikipedia Commons and Google Maps, 2018)
Fig. 2. Intersection between San Francisco and Alessandri Streets, San Pedro de Alcántara. (Author 2019)

The houses are one-storey rectangular buildings, with adobe walls and partitions, clay tiles and wooden roofs. Windows and doors are tall, vertical and narrow, due to the structural restrictions of adobe, and distributed evenly through the wall's extension, mostly in a symmetric layout. The houses usually have interior courtyards, with corridors acting as transition spaces between the interior and the exterior (figg. 3–5).

Two main areas can be identified in this town, according to their historical, urban and architectural characteristics. The first one corresponds to the foundational layout adjacent to the *San Pedro de Alcántara* esplanade, built at the end of the seventeenth-century. It includes the church and monastery, as well as a few remaining adobe houses from the old town (CMN n.d.). The church has a single nave layout, with adobe walls, counterforts, and a wooden gable roof covered by clay tiles. The façade showcases a porch with four wooden pillars on stone bases, a lateral corridor of similar structure, and a wooden tower protruding from the front half of the roof. This design is similar to the one from the original

church – destroyed by an earthquake in 1906 – although its location within the complex changed and an exterior corridor and porch were added (fig. 6) (Ferrari 1970).

This area was designated a Typical Area (*Zona Típica*) on 7 January 1974, one of the five categories of historic sites or monuments established by the National Monuments Law of 1970 – see section 1.3.

The second area is located south of the Las Garzas creek, and was developed in 1906 after a flood destroyed the old village. It showcases large properties with detached adobe houses, alongside some continuous construction, also in adobe. This area was included in the boundaries of the Typical Area in 1996 (fig. 7).

1.2 History of San Pedro de Alcántara

After the destruction of the cities south of the Biobio river at the end of the sixteenth-century, Spanish inhabitants moved towards the northern areas where conflict with natives had ended.[1]

Images, Clockwise from top left:
Fig. 3. Houses at Manuel Rodriguez Street, San Pedro de Alcántara. (Author 2018)
Fig. 4. House at Alessandri Street, San Pedro de Alcántara. (Author 2019)
Fig. 5. Houses at Llico Street, San Pedro de Alcántara. (courtesy of CMN 2017)
Fig. 6. View of San Pedro de Alcántara's Church, grotto and esplanade. (courtesy of CMN 2017)

▶
From top to bottom:
Fig. 7. Map of the boundaries of the Typical Area of San Pedro de Alcántara, showing the two main areas of development: the foundational area (yellow) and the "new town" built after the 1900 flood (purple). (Author, based on the original drawing from the land deed of 1690, with boundaries drawn by CMN in 1996)
Fig. 8. Map of the three touristic trails created by the Ministry of National Assets (MBN) based on what is believed were the routes of the Royal Roads *Camino de la Costa* (coastal road) in red; *Camino del Centro* (centre road) in purple; and *Camino de la Frontera* (frontier road) in orange. (Author, based on data from the MBN, 2019)
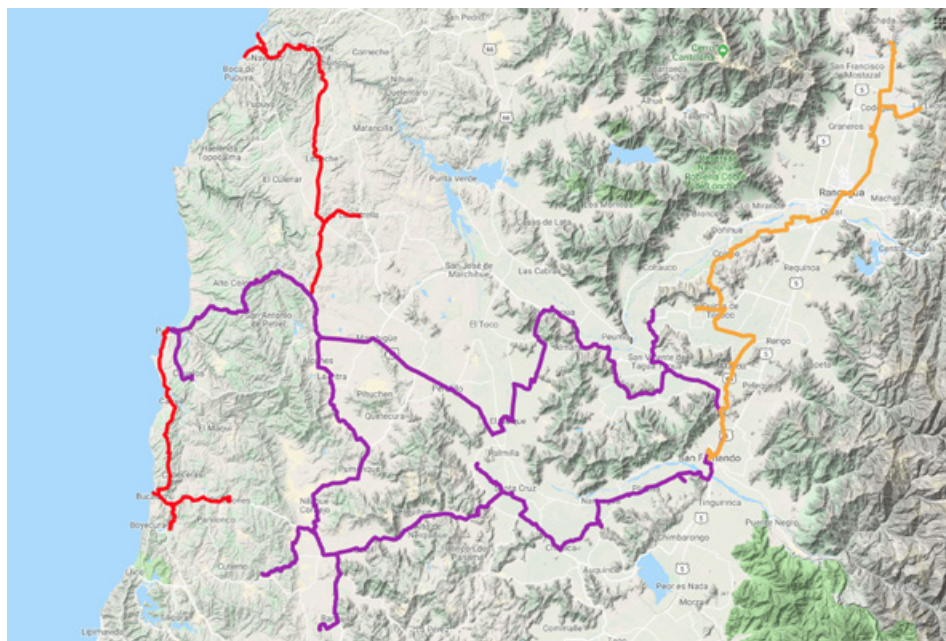
Encomenderos[2] and landowners were first attracted to the coastal area of what is now the Colchagua and Curico provinces, in the central valley of Chile. This area, at the time, offered more advantages in terms of agricultural production. The mild weather made it a preferred location for Aboriginal settlements, who were seen as labour by the Spaniards, and there were gold placers at some creeks in the Vichuquen area (Ferrari 1970).

From the sixteenth to the nineteenth-century, Santiago,

Concepción and the cities south of the Biobio were connected through three routes: The Border, Centre and Coastal Royal Roads (fig. 8). The most used route during the colonisation time was the Centre road, since it facilitated the crossing of rivers and avoided wading the dangerous Teno river (Ferrari 1970). It was followed in popularity by the coastal road, which avoided the winter mudslides and the dust of the valleys in the summers, and was the only route connected to the Valparaiso port (Ministerio de Bienes Nacionales 2014).

Land grants (*mercedes de tierras*)[3] began in this area around 1559, and Vichuquen started as a settlement around 1585. A parish was constructed between 1646 and 1658 under the leadership of Father Martin de Oyarzún, and had under its jurisdiction three chapels, one of them being *Nuestra Señora de las Nieves*, also known as *Capilla de las Paredes*, which was to give rise in 1778 to the parish and town of Paredones (Ferrari 1970).

1.2.1 The Foundation of San Pedro de Alcántara

Despite the fact that the Spanish crown had prohibited the establishment of monasteries where there were already clergy assigned by Bishops or Archbishops, a mission from the Franciscan Order was founded about 20 Km (12 miles) northeast of the Vichuquen parish. The land – known as *San Antonio de Quen-Quen* – was part of the dowry of Francisca Muñoz de Gormaz, who donated it to the order in 1690. The following year, Fray

Fig. 9. (top) View of the current church from the grotto. (bottom) View of the original church from the grotto. Drawings based on historic data collected by Claudio Ferrari for the article "El Convento Franciscano de San Pedro de Alcántara en el Siglo XVIII y Comienzos del Siglo XIX", *Revista Historia*, 1970

Bernardo de Hormeño arrived with other friars to start construction of a small lodge to shelter priests travelling to the missionary houses they had further south.

In 1711, plans began to build a church and monastery. The task required authorisation from the *Real Audiencia*[4] in Spain, and after a series of allegations the King ratified in 1717 the establishment of the mission and approved the building of a monastery. Construction began shortly afterwards, thanks to donations made by the community, and soon the old town began to form around it. Twenty-four Chilean palms were planted in the esplanade, and the order acquired more land. The monastery received a steady income from *capellanías*[5] and *primicias*[6] that came even from distant towns and parishes, as well as donations made by community members. In 1778, the parish of Paredones was created, and the monastery fell under its jurisdiction.

During the first years of the Republic[7] the monastery had already been in existence for over 100 years. The parish complex had an orchard, a small vineyard and a school, and in 1826 the church received donations to build an altar and to purchase a bell (Ferrari 1970). If in 1740, there were nine priests in the monastery, by 1825 there were fifty-eight (CMN n.d.).

However, the second half of the nineteenth-century marked the monastery's decline. In 1900, an overflow from *Las Garzas* creek destroyed most of the houses in the old town and caused considerable damage to the monastery. Six years later, an earthquake completely destroyed the church.

The following year, as the Franciscan Order left town, San Pedro de Alcántara was designated a parish, and construction of a new church began. The building was completed in 1914 (fig. 9).

It is not clear when the church cemetery disappeared, although some tombstones have been found (Ferrari 1970).

As a way to prevent future losses, the town was rebuilt on higher grounds south of the creek. One of the alleys of the old town still exists, and some markers of the old property lines can still be identified (Ferrari 1970).

Figg. 10–12. Aerial views of San Pedro de Alcántara in 1978, 1994, and in 2019, zooming into the central blocks of the town. Blocks remained mostly unchanged after the 1985 earthquake, but considerable changes can be seen in block composition after the 2010 earthquake, with several buildings disappearing. (courtesy of Servicio Aerofotogramétrico de Chile)

Some of the Chilean palms that were planted during construction of the original church still remain as the main features of the esplanade in front of the monastery. They were included within the boundaries of the area designated in 1974, and therefore have the same level of legal protection as the buildings around them. Each spring, they witness the pilgrimage of farmers and devotees from all corners of the O'Higgins Region that come to the San Francisco Festival, one of the main events of San Pedro.

The town survived weather ravages and seismic activity with relative ease during the twentieth-century (figg. 10–12), until the 2010 earthquake, when several houses and the church suffered considerable damages.

1.3 San Pedro de Alcántara's Designation as a Typical Area

Chile's main law regarding the preservation of historic sites is known as the "National Monuments Law" (*Ley 17.288 de Monumentos Nacionales*), which was enacted in 1970 to replace an existing decree from 1925.[8] Although this new law expanded the designation typologies, it mostly condensed old regulations and included few modifications in comparison with its predecessors (Skoknic 2015).

The law establishes five categories of historic sites or monuments: Historic Monuments (movable or immovable property); Public Monuments (structures and/or objects located in public spaces); Typical Areas (groups of buildings or structures); Nature Sanctuaries (terrestrial or maritime sites); and Archeological Monuments (movable or immovable property below the surface).[9] They all are under the control and supervision of the National Monuments Council (CMN) (Ministerio de Educación 1970), a technical agency within the Ministry of Culture, Arts and Heritage.[10] The Council has twenty-two Council members[11] that meet at least once a month[12] at their offices in Santiago. Regional offices act as advisors for the Council and the public, but their testimony is not binding (CMN n.d.).

San Pedro de Alcántara's church was designated as a Historic Monument in 1972, being one of the first buildings protected under the National Monuments Law. Because of this, there was no framework established to nominate a site, thus the Designation Decree only includes the name and location of the church[13] without further documentation. The same applies to the designation of the old town as a Typical Area in 1974, only this time the Decree[14] noted as the basis for the designation <<the need to preserve the environmental characteristics of the town>>. However, the boundaries of the Typical Area were not established, so in 1996 a new Decree[15] annexed a map that included the new town developed after the 1900 flood (fig. 7).

At the time of the 2010 earthquake, the National Monuments Law presented three main challenges that needed to be addressed in order to implement any rebuilding effort:

1) Neither the law, nor its subsequent modifications, consider any form of financial incentive for property owners.[16]

2) All conservation, repair or restoration work on any designated monument is subject to prior authorisation from the Council.[17] Current interpretations of the law establish that this includes the interior of a building, its structure and its exterior.[18]

3) To obtain said authorisation, the owner of the property must submit a technical dossier sponsored by an architect or a professional from a related field, regardless of the type of work. The file is reviewed by a staff member at the Council's central office in Santiago, and discussed by a committee before it is presented to the Council for a final decision[19] CMN 2011).

As for design guidelines, no such tool existed for San Pedro or any of the other ten rural settlements designated as Typical Areas that were affected by the earthquake.[20] The National Monuments Council quickly acknowledged this and distributed general guidelines to government officials and municipalities in those regions. They also developed protocols with other government institutions to expedite project reviews and agree on criteria for project evaluation until specific guidelines for each area were developed.[21]

In June of 2011, the Architecture and Urban Heritage Committee of CMN published design guidelines for San Pedro de Alcántara, based on the work done by a group of students from Universidad de Chile's School of Architecture as part of their professional internship during 2010 (Vargas 2018).

1.4 Social and Economic Setting

San Pedro is a rural town in a rural commune.[22] Even though it is one of the oldest settlements in the area, the main services and local government offices are located in the town of Paredones, 24 Km (15 miles) north and accessible by only three routes. Public transportation only works during weekdays, and mainly goes to the neighbouring town of Lolol[23] – located 19 Km (12 miles) to the east (fig. 13).

▶
From top to bottom:
Fig. 13. Location of San Pedro de Alcántara (bottom circle) in relation to Paredones (top left circle) and Lolol (right circle). (Author, based on Google Maps)
Fig. 14. Population growth over the last 36 years in Chile, the O'Higgins Region, and Paredones commune (where San Pedro is located). (Author, based on census data)
Fig. 15. Rural population growth over the last 36 years in Chile, the O'Higgins Region, and Paredones commune (where San Pedro is located). (Author, based on census data)
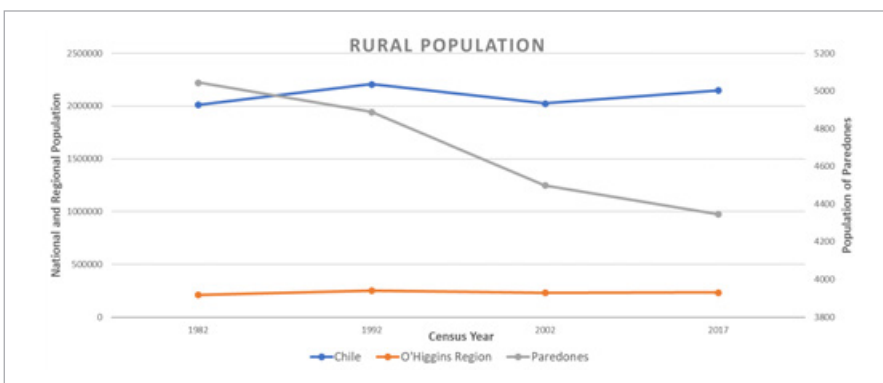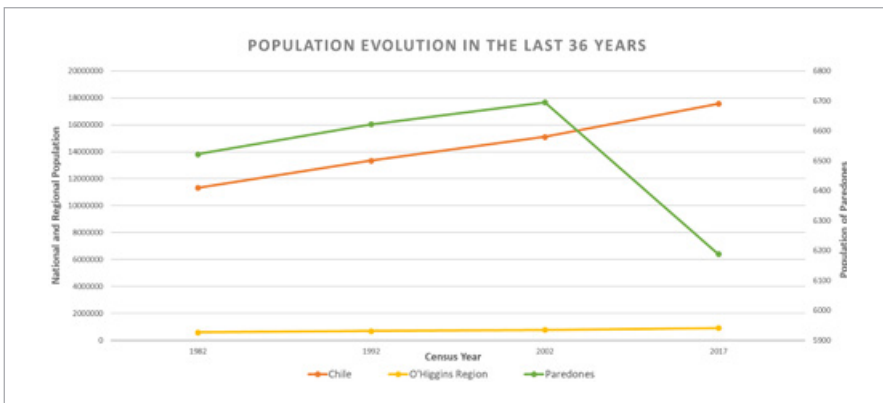
San Pedro's dependence on Paredones, means that residents usually leave town to run errands, go shopping or to work.[24]

Paredones is facing depopulation. According to National Institute of Statistics (INE) census data, Chile's total population has progressively increased over the last 35 years, but the commune's numbers have been decreasing since 2002 (INE 2018b) (fig. 14).

This is even more dramatic when we focus only on rural population. National and regional averages have shown little fluctuation over the last 35 years, but there has been a continuous decline in the population of rural Paredones. The area went from 5,045 people in 1982, to 4,346 people in 2017 (INE 2018a). This is a 13 per cent decrease in population (fig. 15).

If we consider that rural population has shown a 6 per cent growth during this period, and that urban population has increased by 65 per cent (INE 2018b), it becomes clear that this is a serious issue. Rural communes like Paredones might be facing a halt in growth, but rural towns like San Pedro are in fact shrinking at a fast pace.

As for economic activities, San Pedro is a town predominantly devoted to agriculture (INE 2018a). There are not many other options for young people, especially since more attractive occupations and wages are available in larger cities.[25]

Census data also shows that 19.3 per cent of the surveyed population are retired and/or living on a pension, and 25.9 per cent do unpaid housework. This puts San Pedro in a difficult position when facing a rebuilding process, since older adults cannot actively participate in making repairs nor can they afford to hire help,[26] and households with a single income will probably have to go into debt in order to do so.

As for the housing stock, a total of 489 units were identified in the census of 2017. Of this total, 34.1 per cent are adobe structures, considerably surpassing the regional total of 5.1 per cent and the national total of 2.2 per cent (INE, 2018a). (fig. 16)

This is also indicative of how national policies can have dramatically different results when analysed from two different scales: policies that are designed considering that only 2.2 per cent of the housing stock is built in adobe will have a significantly different result in areas where 34.1 per cent of the houses are built in adobe.

2. The Nature of the Impacting Event(s)

On 27 February 2010 an earthquake with a magnitude of 8.8 hit six regions in south-central Chile at 3:34 AM, local time. It was soon followed by a tsunami that caused major damage to more than 310,000 miles of coastline, affecting a geographic area where 80 per cent of the total population lives. Together, they resulted in 526 deaths, millions of dollars' worth of damaged infrastructure, and 370,000 destroyed homes in over 900 cities and towns (Ministerio de Vivienda y Urbanismo 2011).

This was the strongest earthquake to strike the region since 1960, when the city of Valdivia was destroyed by what is considered to be the most intense earthquake ever recorded by seismographs.

In the O'Higgins Region, rural communities were isolated for several days. Access to drinking water was restricted

PREDOMINANT MATERIALS
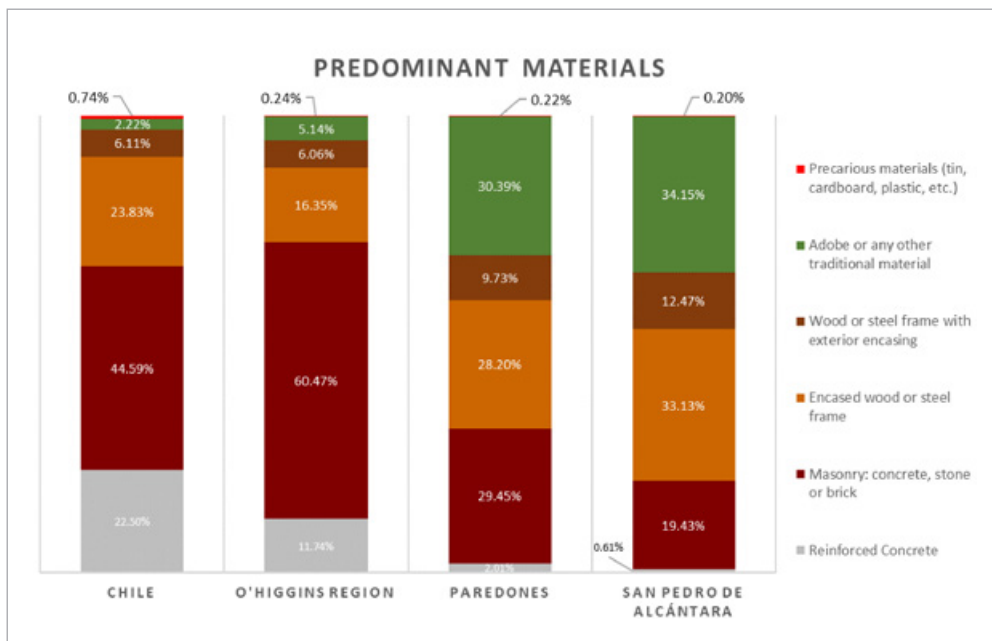
Fig. 16. Predominant materials in housing units at a national, regional, communal and town level. (Author, based on census data)

Fig. 17. National total
of damaged housing
units by predominant
material. (Author, based on
information by MINVU, 2011)
Fig. 18. Distribution of
damage in adobe structures
by region. (Author, based on
information by MINVU, 2011)
Fig. 19. Map showing the
areas of implementation
of the Heritage Rebuilding
Programme in the O'Higgins
Region. Includes designated
(red) and proposed (orange)
historic areas under the
National Monuments Law,
designated and proposed
historic areas under zoning
laws (yellow), and the new
category of Heritage Value
Areas (purple) created
only for the purposes
of this programme.
(courtesy of SEREMI
MINVU O'Higgins, 2011)

due to the collapse of pipelines and power outages that affected pumping systems. (Unidad de Evaluación de Desastres CEPAL 2010).

On the coastline, the tsunami flooded several blocks inland of the city of Pichilemu, and up to 2,000 ft. in the town of Bucale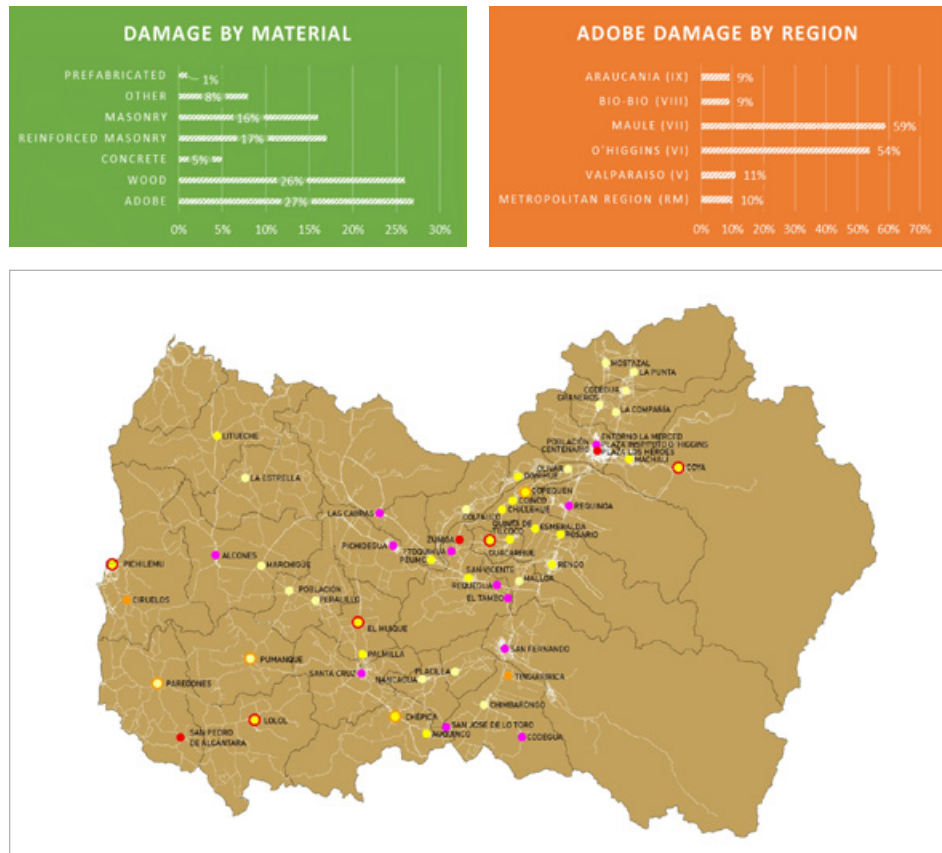mu. Road and rail infrastructure suffered considerable damage, with highways, bridges and crossings destroyed in several locations in the Region. The wine industry suffered considerable losses due to the destruction of storage facilities and the lack of irrigation for the vineyards. The majority of hospitals and healthcare facilities remained operational, but only 3 per cent of schools were left in good condition. (CEPAL 2010)

3. Post-Event Appraisals

Initial reports prepared by the Ministry of Housing and Urban Development (MINVU) showed that in the six affected regions, a total of 370,000 homes suffered serious damage. Of that total, 135,000 were built in adobe and located mostly in rural areas. Later

evaluations would determine that 27 per cent of the damaged houses corresponded to adobe structures (fig. 17), indicating that this typology had become more vulnerable to seismic activity.

At a regional level, the O'Higgins and Maule Regions had the highest percentage of adobe houses damaged (fig. 18), also indicating that rebuilding efforts would be different in each region from a technical perspective.

As for heritage areas, it was noted that there were no up-to-date or accurate records in the zoning maps of the designated buildings and areas, therefore extensive work had to be done to share information between the different organisations and government agencies that document heritage sites and structures (MINVU 2011). This resulted in a database (fig. 19) that compiled all the buildings and areas that were protected either by the National Monuments Law[27] or the Municipality's current zoning law.[28] It also included areas and buildings that were in the process of being designated by one of these tools at the time of the earthquake (Muñoz 2014a).

3.1 The 2010 Earthquake in San Pedro de Alcántara

In San Pedro de Alcántara, basic services (electricity, drinking water) were interrupted for several days, with people staying in tents in their backyards for over a month, fearing their homes would collapse but not wanting to leave them. Municipality officials visited the town and quickly established protocols for distributing aid, with help from representatives of the San Pedro de Alcántara parish (Vargas 2018).

Damage evaluations began shortly after the earthquake, with houses being visited by professionals from the municipality and/or volunteers (fig. 20). Because San Pedro had been a designated Typical Area for over 35 years, homeowners and local authorities were familiar with the protocols and regulations, so they waited for damage evaluations to be done by specialised professionals before making any decision about total or partial demolition. Unfortunately, this was not the case for many other historic areas[29] (Vargas 2018).

Residents remember their homes being evaluated by at least one group of professionals, either from the municipality or from the consultants that developed their restoration/reconstruction projects. Some of them even mentioned that so many people came that they could not identify anyone in particular.

As for the San Pedro de Alcántara church, it was undergoing restoration work at the time of the earthquake. This prevented the complete collapse of the parish complex, with only areas of the church and auxiliary structures suffering more severe damage (partial collapse of walls, diagonal cracks on walls, vertical cracks in corners, horizontal cracks between roof beams, etc.).

4. Response Actions, Timeframes, Resources and Costs

4.1 A National Rebuilding Programme

Chile is by definition a seismic country. To date, there have been 113 earthquakes of magnitudes above 7.0 Ms (Universidad de Chile n.d.), placing it among the countries with the highest risk of natural disasters (Institute for Environment and Human Security 2016). This has had a strong impact on building tradition and legislation and has become part of the collective identity of Chileans.

◄
Fig. 20. Professors from Universidad de Chile's School of Architecture during a site visit to San Pedro de Alcántara. (courtesy of SEREMI MINVU, 2011)

At the time of the 2010 earthquake, the centre-right coalition (*Alianza*) was in the process of taking office for the first time in 20 years. The new incoming government officials made a series of key decisions that would frame the recovery process in a unique way:

1) Housing recovery would be funded mainly through government funding (MINVU 2011 , 2010).
2) Existing ministries, their programmes and budget lines would be used for the recovery effort. No special ministry or agency would be created. Regional Governors (*Intendentes*) would help coordinate the process at a local level (Comerio 2014).
3) The lowest three income quintiles – about 60 per cent of the population – would be eligible for subsidies from the housing ministry. This meant that working and middle class families could participate, focusing more on need than income (Comerio 2014).
4) A registry of disaster victims was created, serving as the basis for all housing subsidies (Comerio 2013; Muñoz 2014b).
5) Houses would be rebuilt on the same original site, with families being relocated only as a last resort, even during the emergency phase. This prevented displacement, allowing people to keep their jobs and family networks, while also supporting local builders and keeping funds in the communities (Comerio 2014).

This last criterion was controversial and sparked heated discussions between politicians and developers. Practically speaking, it meant that housing reconstruction would be scattered over thousands of towns and rural regions on individually owned sites (Muñoz 2014b), making the process slow and cumbersome. It was, however, the single element that opened the door for preservation efforts. By working from a placed-based perspective and focusing on rebuilding what was once there instead of starting anew, the goals of heritage preservation aligned with the goals of the rebuilding process, thus making it possible to combine them.

4.2 The Case of the O'Higgins Region

In the O'Higgins Region, a local Architect and Preservationist – Nieves Cosmelli – was appointed as Regional Secretary for the housing ministry. She quickly realised that it would not be possible to address the damage in O'Higgins effectively through regular subsidies and current building techniques, and argued that unless adobe structures were included in the rebuilding process, an important part of the region's identity and culture would be lost (Silva 2018).

After initial discussions about the feasibility of repairing and rebuilding small-scale vernacular architecture – which had been left out of the academic world and excluded from building regulations for the past 25 years – MINVU decided to include in the National Rebuilding Plan a Heritage Rebuilding Programme specifically dedicated to this typology in the historic areas of the affected regions (MINVU 2011), thus preserving the building tradition and local identity.

A team was created in the Regional Secretariat of the Housing Ministry (SEREMI) to help design and implement this programme. They worked closely with mayors to understand each town's needs and available resources, and served as a link between the different public and private entities involved as well as the community (Silva 2018). This was particularly crucial when dealing with rural areas like San Pedro, where access to information and resources is limited. The constant communication between the SEREMI team, municipality officials, consultants and the community allowed for administrative and legal issues to be addressed in a timely manner, while providing constant technical support.

Similar teams were created in the other affected regions, and a national coordinator was appointed to maintain communication and help create general guidelines and unified criteria. Because the challenges of each region were different, the teams adapted the programme's implementation to fit their particular needs (MINVU 2011; Muñoz 2014b). For example, the damage in the Maule region called for a larger number of new construction projects than restorations, focusing on adapting contemporary materials to vernacular design (fig. 21). In the Biobio Region, the main focus was industrial heritage given the region's strong connection to coal mining and manufacturing companies, with design solutions having to address contemporary materials like concrete and brick, while designing strategies to repair collective dwellings (fig. 22).

Images, Clockwise from top left:
Fig. 21. New houses designed by the architectural firm Polis for the historic centre of Talca, in the Maule region. (Plataforma Arquitectura, 2011)
Fig. 22. Construction work in Lota, BioBio región. (courtesy of MINVU, n.d.)
Fig. 23. Community meeting in Lolol about the Heritage Rebuilding Programme, with representatives of MINVU and the Municipality. (courtesy of SEREMI MINVU, 2011)
Fig. 24. Community meeting in Paredones about the Heritage Rebuilding Programme, with representatives of MINVU and the Municipality. (courtesy of SEREMI MINVU, 2011)

4.3 Management and Organisations Involved

Although each of Chile's 15 regions has an appointed governor and each municipality has an elected mayor, the current democracy has only been in place since 1990, and the national Chilean government, with an elected president and legislature, dominates policy through national ministries with regional staff offices (Comerio 2014).

Leadership for housing recovery was expected to come from the Ministry of Housing and Urban Development (Comerio 2014) with most local governments needing its support – financial and technical – to embark on rebuilding efforts.

In the O'Higgins Region, this allowed the team created in the SEREMI to be recognised organically as the group in charge of the Heritage Rebuilding Programme, with the authority to make decisions and implement procedures as well as to provide technical assistance to local authorities and municipal officials (figg. 23–24). Furthermore, because of this agency's attributions, the team was able to be actively involved in all stages of the process, from initial surveying to construction (Silva 2018).

Paredones' Municipality had two historical areas participating in the Heritage Rebuilding Programme: San Pedro de Alcántara (as the officially designated area) and the historic centre of the town of Paredones (which did not have legal protection but was designated as a Heritage Value Area by SEREMI).[30] The municipal

team was tasked with channelling applications for the subsidies and hiring consultants to develop projects. However, they did not actively participate in the design or construction process, thus the community communicated directly with the consultants and/or the SEREMI team. A couple of community members of San Pedro acted as liaisons and kept people informed, enacting spontaneous or situational leadership. Unfortunately, this organisational structure was not consolidated or sustained over time.

4.4 Legal and Financial Tools

The main concern about the feasibility of the Heritage Rebuilding Programme was the lack of a Chilean building code for adobe structures (MINVU 2011). Existing regulations allowed for the use of foreign codes, but it required an architect or engineer to sponsor its use,[31] thus increasing costs and the time required to develop a proposal. Also, building permits had requisites and a timeframe incompatible with an emergency phase, and building standards were not applicable to historic houses.

In order to solve this, the ministry started to work with the National Institute for Standardisation (INN) on a building code for adobe structures,[32] and in parallel, worked with SEREMI and each region's Housing and Urban Development Service (SERVIU) to identify ways to use the existing regulations to bypass this requirement,

and to create specific emergency building permits that made certain exceptions and expedited processes.[33]

As for funding, the strategy used was to pool together resources (figg. 25–26). Regional government funds assigned to each municipality for infrastructure every year[34] were used to cover design costs, since a different level of expertise was needed (Muñoz 2014b). MINVU's existing housing subsidies underwent an extensive process of adaptation regarding application and project requirements, and an increase of US$8,000 was given to projects that preserved the building's historic architectural features. These funds were intended to cover construction costs (Muñoz 2014b).

Since the available funds were – of course – not enough to restore entire properties, projects were designed in stages: the first phase was destined to restore the house's habitability (as minimum, a living/dining room, kitchen, bathroom and bedroom should be repaired); and a second phase would include extra rooms, interior finishes and other non-structural work. Some exceptions were made when the rooms mentioned above suffered minor or no damage[35] (i.e. if the bathroom and kitchen were in good condition, there was no need to include them in the first phase of the project). Also, the specific needs of each owner were considered when determining priorities and stages of work. For example, houses where older adults lived prioritised accessibility and safety improvements.
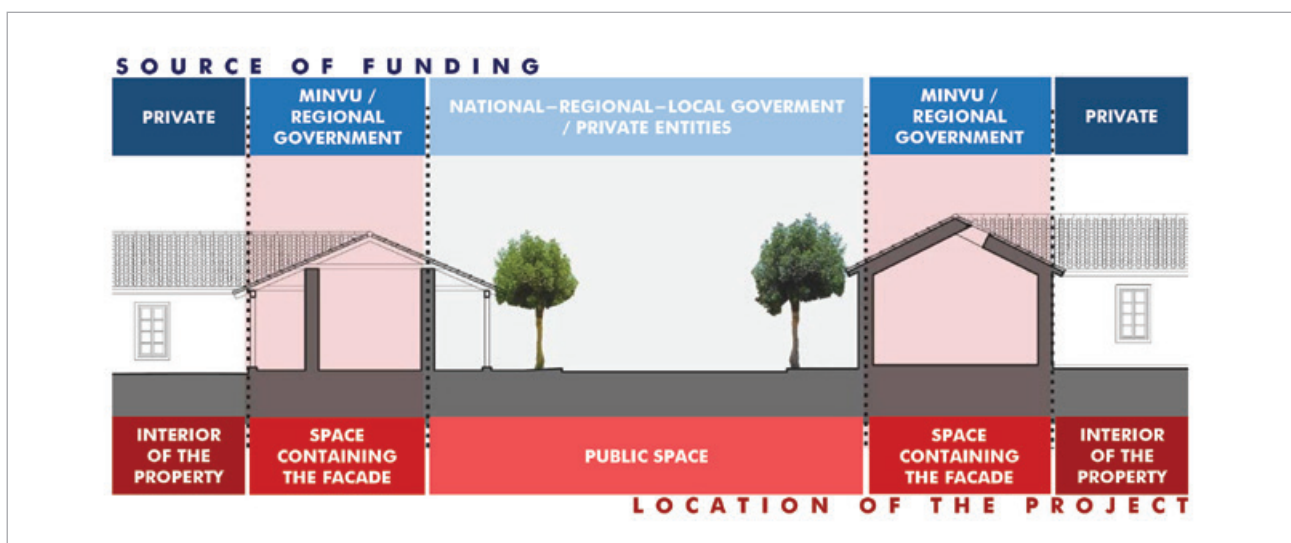

Fig. 25. Relationship between rebuilding efforts and sources of funding. (courtesy of SEREMI MINVU O'Higgins, 2014)

▶
From top to bottom:
Fig. 26. Types of subsidies utilised, amounts and increases for Heritage Areas. (courtesy of MINVU, translated by author)
Fig. 27. Timeline for housing reconstruction within the National Rebuilding Plan, showing that the total of housing units would be completed by February of 2014 (highlighted row). (courtesy of MINVU)

SUBSIDY TYPE	BASE AMOUNT	PLOT IMPROVE MENT	INCREASE FOR HERITAGE AREAS	DESIGN	INCREASE FOR DESIGN	OTHER CONTRIBU TIONS	TOTAL
CSR (rebuilding or structural repairs)	380 UF (14,600 USD)	60 to 80 UF (2,300 USD to 3,000 USD)	200 UF (7,000 USD)	28 UF (1,000 USD)	Up to 30 UF (1,100 USD)	25 UF (900 USD)	Up to 743 UF (27,600 USD)
PPPF (minor repairs)	55 UF (2,000 USD)	---	200 UF (7,000 USD)	Up to 6,5 UF (250 USD)	Up to 9,5 UF (350 USD)	25 UF (900 USD)	Up to 296 UF (10,500 USD)
DS40 (rebuilding or structural repairs)	350 UF (13,500 USD)	---	200 UF (7,000 USD)	---	---	35 UF (1,300 USD)	585 UF (21,800 USD)
ACA (rebuilding or structural repairs)	300 UF for materials (11,000 USD)	90 UF for workers (3,000 USD)	200 UF (7,000 USD)	60 UF (2,300 USD)	---	---	650 UF (23,300 USD)
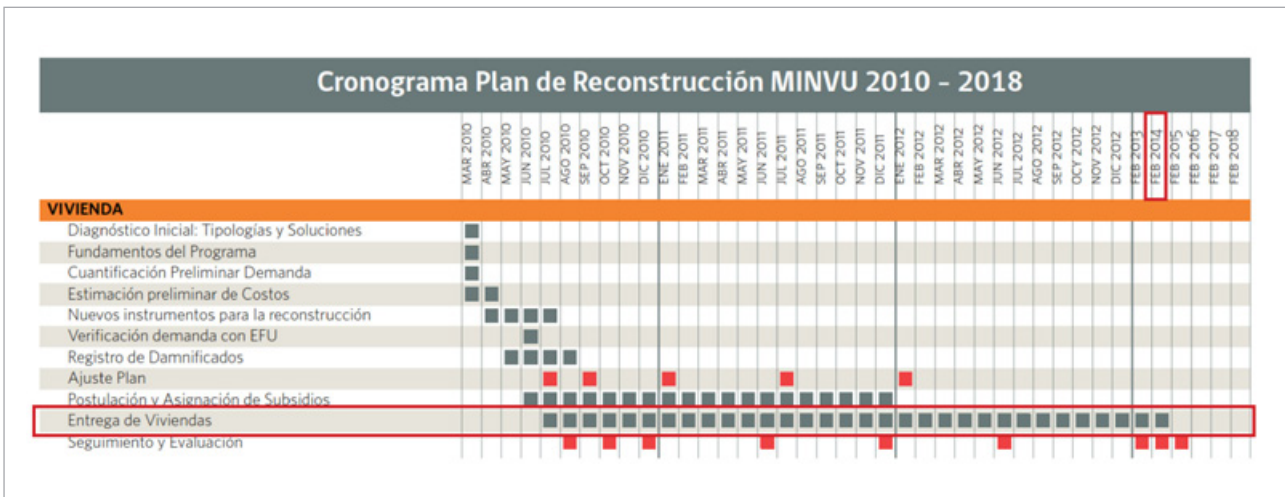
This strategy was aligned with the "pooling together resources" criteria established for the rebuilding process, which in cases like San Pedro was the only way to undertake such a task. The experience and knowledge acquired during the first stage allowed the owner, builders and consultants to face a second stage from a better standpoint, optimising future resources.

4.5 Timeframe

Chile's National Rebuilding Plan stated that housing and neighbourhoods would be recovered in four years (fig. 27), leaving public space projects to be completed by 2018 (MINVU 2010). The main deadline coincided with the government's term, a fact that was – and still is – criticised by experts in the area (Diario UChile 2017), opening the door to constant questioning about the validity of the

figures reported by public agencies (Bustamante 2012).

The Heritage Rebuilding Programme was grouped with the housing targets, and the initial calendar stated that construction work would start in June 2011 (MINVU 2010). This conflicted with the level of complexity of the projects and the scale of the construction phase. Compared with new social housing developments, projects from the Heritage Rebuilding Programme were always "slower", since each house needed a preliminary evaluation, several proposal reviews and approvals from organisations like the National Monuments Council, before starting construction.

When interviewed, professionals who participated in the programme agree that the process took too long, mainly because this was a new topic in housing policies,

and restoring vernacular architecture was more difficult and costly. Since adobe restoration had been done only in the private sector for the last 25 years – with some exceptions in the case of national monuments – there were no cost references or timeframe estimates that could be applied to these projects.[36]

Residents of San Pedro de Alcántara also characterise the programme as being <<too slow>> citing paperwork as the main issue causing this delay. However, this was not considered as enough of a reason to rule out restoring their houses. Preservation was not seen as contrary to the goals of a rebuilding process.

A conclusion drawn from these evaluations about the timeframe is that despite expert statements that a four-year deadline was unrealistic (Valenzuela 2012), people still perceived the process as lengthy.

4.6 Implementation in the O'Higgins Region

4.6.1 Community Outreach

After the initial surveys were completed and the eligible families were identified, a series of meetings were held by the SEREMI team with the community and local authorities to introduce the programme, its requirements and benefits, as well as to provide guidance through the application process (Silva 2018) (figg. 28–29).

In addition, a series of workshops was held in a few communes about adobe structures and their conservation (fig. 30). Hosted by universities and preservation non-profits with experience in adobe, in partnership with MINVU, these training sessions covered basic topics like brick composition and compatible materials, to more advanced concepts like types of damage and design criteria.

▶
Images, Clockwise from top left:
Fig. 28. Community meeting in San Pedro about the Heritage Rebuilding Programme, with representatives of MINVU and CMN. (courtesy of SEREMI MINVU, 2011)
Fig. 29. Banner installed by MINVU with information about San Pedro's participation in the Heritage Rebuilding Programme. (courtesy of MINVU, 2011)
Fig. 30. Workshop in mud stuccos held in Quinta de Tilcoco. (courtesy of SEREMI MINVU, 2011)

This allowed for a more unified technical language and helped debunk myths and misconceptions about adobe structures caused by the abandonment of building tradition after the 1985 earthquake. It also contributed to the creation of local networks of specialised professionals, contractors and workers (Silva 2018).

Of the forty-four buildings surveyed in San Pedro de Alcántara's designated area, thirty-one families initially applied for subsidies from the Heritage Rebuilding Programme. Due to legal difficulties and other personal conflicts, six people resigned or were not able to use their subsidies, bringing the final number of participants to twenty-five.

A total of five consultants were hired for the development of projects in San Pedro de Alcántara: *Culturas Constructivas* Collective, *Universidad de Chile's* Centre for External Projects, *Zócalo* Architects, Architect Paz Gálvez, and Architect Pablo Cárdenas. Each family worked with a consultant to develop their individual project, and most of them stayed in touch during the construction phase.

Two of those consultants – *Culturas Constructivas* Collective (represented by Javiera Demetrio) and *Universidad de Chile's* Centre for External Projects –

developed two workshops as part of their methodology:

- The first one was *Involucrándonos con la Vivienda* (getting involved with our house) and was held in July 2011. It focused on explaining how these subsidies worked, the types of building techniques that were allowed, and the steps involved when going from sketches to technical drawings (Vargas 2018) (fig. 31).

- The second one was held in September 2011 and was entitled *Así se Construirá mi Casa* (How will my house be repaired?). Here, consultants presented the proposals developed with each owner over the past few months (Vargas 2018).

After those activities, each family continued their communication with the consultants according to their needs and availability. Other consultants worked individually with each family from the beginning.

4.6.2 Damages and Subsidies

As part of the initial surveys, buildings were evaluated by local professionals to establish the level of damage that each one suffered, categorising it as "minor" (damage to finishes, windows, doors, roof tiles, etc.), "major" (visible cracks, damage to the roof structure, wall tilting, etc.) and "uninhabitable" (wall collapse, roof collapse, etc.).

◄

Fig. 31. *Involucrándonos con la Vivienda* workshop in San Pedro de Alcántara. (courtesy of SEREMI MINVU, 2011)

▶
From top to bottom:
Fig. 32–33
View of Ive Correa's house, located in the corner of Llico and San Francisco Streets, before the earthquake and during construction. (courtesy of MINVU)

The reports resulting from this evaluation established what kind of subsidy was applicable (MINVU 2011, 2010), but in the case of adobe structures they were not always accurate (Ramorino 2018).

As a way to solve this, the SEREMI team established a protocol that required each consultant to undertake their own evaluation of the property before determining what type of project would be developed – repairs or new construction. Demolition – total or partial – was only authorised when the damage was too extensive or structural repairs would not be possible with the available funds (Ramorino 2018).

In San Pedro, all the houses that participated in the programme were categorised as "inhabitable", meaning they could access the highest subsidy available.

Because of the difficulties in connectivity and small number of projects, priority was given to DS40 subsidies (see fig. 26). These were owner-driven reconstruction (ODR) subsidies, allowing owners to hire local contractors or independent workers directly (figg. 32–33). However, it also required them to make the initial investment, which would be refunded by MINVU once the work was finished and a certificate of completion was issued by the municipality (Muñoz 2014b).

4.6.3 Design Review and Construction Monitoring

Due to the high number of projects that would be developed through this programme, systems of collaboration were established between consultants and the agencies responsible for the design review, in order to generate unified criteria and expedite processes (MINVU 2014). Checklists were simplified, formats were homogenised and a system of weekly technical meetings was implemented to discuss technical issues and the solutions proposed by consultants (Ramorino 2018).

A partner team was then created at SERVIU, with specialised professionals to review projects and supervise construction work (figg. 34–36). The team would later expand to take on administrative work for cases where municipalities did not have enough capacity to do so (Muñoz 2014b).

Projects in San Pedro were reviewed according to the design criteria developed in 2011 by CMN.[37] The document was based on a detailed analysis of the architectural features and morphology of the existing buildings, stating that any restoration work or new construction must follow the same parameters. It also established that traditional building techniques (adobe masonry and *quincha* [seismic-resistant wood & reed, or giant cane, structures covered with mud plaster]) were the preferred option. The use of brick, reinforced concrete and other contemporary techniques would only be permitted in exceptional cases, individually evaluated by the Council (CMN 2011).

Monitoring the work was mostly in the hands of the MINVU team (SEREMI and SERVIU), with some consultants actively participating in the process. Funds devoted to this task were insufficient in a town as isolated as San Pedro, so it was up to the consultants to determine how involved in the process they could be.

Work in San Pedro began in 2012, after the first project was approved by CMN and the consultant was able to secure a local contractor. The process is described as very difficult by the architect in charge, due to the builder's breach of contract by leaving town before finishing the work. Although the builder eventually returned,

Images, Clockwise from top left: Figg. 34–36
Site visits by SERVIU professionals to monitor construction progress and project modifications. (courtesy of SEREMI MINVU O'Higgins)

▶
From top to bottom:
Figg. 37–38 View of Leonardo Peñaloza's house in Manuel Rodriguez Street, before and after repairs were completed. (courtesy of UChile and CMN)

the architect opted to move to San Pedro to oversee the work closely, optimising the already scarce resources available. The experience however, proved to be extremely positive in reassuring other homeowners that repairing their homes was possible, promoting collaboration among neighbours when builders were not available (Vargas 2018).

When evaluating the experience, most of the owners see it as positive, especially for those who maintained a good relationship with the consultants and were able to make adjustments during the construction phase (figg. 37–38).

Unfortunately, most of the homeowners were not able to continue repairing the rest of their property[38] due to lack of funds. This is particularly challenging for older adults who live alone or with a spouse (which make up half the population of San Pedro's Typical Area),[39] who would not be able to take on this task unless supported in technical, financial and administrative matters. Some families have

been able to continue repairs at a slow pace, with one resident – Ive Correa – restoring one room per year. These families have support networks in and outside the town, accessing information and resources on a more regular basis.

4.6.4 Technical Solutions

Technical solutions implemented by consultants in the O'Higgins Region varied according to type of subsidy, type of damage, where the property was located, the consultant's experience, homeowner's preferences, among other factors. This meant that there were multiple ways of approaching a new construction or a restoration project, and technical criteria needed to consider multiple aspects when deciding which solution was the best.

Within this wide range of solutions, a few can be highlighted as representative of the technical abilities of consultants and the socio-cultural context where they were developed in:

- In the Chepica commune, projects were developed by Larrain & Rodway Architects. The firm designed a house typology using a timber structure with straw bales as filling to achieve the wall thickness of an adobe structure (figg. 39–41). Traditional materials were used for exterior finishes (mud stucco for walls, clay roof tiles, wooden windows, etc.) and compatible materials were used to uphold current building standards (drywall for interior walls and ceilings, ceramic tiles in kitchen and bathroom, terracotta floor tiles, etc.).

The design received ample praise for its ability to maintain a harmonious relationship with existing structures, while bringing new building techniques to social housing subsidies. The community, however, took time to fully embrace the design and required constant reassurance of the quality and safety of it.

The architects also developed seismic retrofitting projects using electro-welded mesh and wooden pillars inserted in the adobe walls. They implemented this solution in all their restoration projects in Chepica, Lolol, Paredones and San Fernando.

- In the Chimbarongo commune, new construction projects were developed by Miguel Galvez Engineering & Builders. The company was a long-time builder of social housing developments and agreed to participate in the Heritage Rebuilding Programme as a new challenge. They were commissioned with designing new houses – using contemporary materials – that would replace severely damaged adobe houses in the town's main street, Miraflores. This request came after homeowners refused to repair them because they considered adobe as being <<unsafe>> or <<too difficult to maintain>>. Since Miraflores Street is not a designated area, there was no legal tool to deny this request.

The design reproduced the architectural features of typical adobe houses in the street and used finishes that resembled traditional materials (figg. 42–43). It also included the design for an expansion that completed the continuous façade, typical of this area. Despite not being an "ideal" solution, this case proved that builders have the capacity to develop designs that take into consideration their context. Homeowners were an active part of the process and celebrated together every time a house was finished.

◀

Images, Clockwise from top:
Figg. 39–41
Construction process of one of the new houses designed by Larrain & Rodway Architects in Chepica. (courtesy of SEREMI MINVU, 2011)

▶
Images, Clockwise from top left:
Figg. 42–43
Construction process of one of the new houses designed by Miguel Galvez Engineering & Builders in Miraflores Street, Chimbarongo commune. (courtesy of SEREMI MINVU, 2012)
Figg. 44–45
Construction process in one of the houses restored by Altiplano Foundation in Peralillo. (courtesy of SEREMI MINVU, 2012)

They remained a cohesive group and applied for funding to build the designed expansions.

• In the Peralillo commune, one of the consultants hired to develop seismic retrofitting projects was the *Altiplano* Foundation. This organisation had ample experience working with churches in the Arica region, specialising in the use of Biaxial Polypropylene Geogrid as reinforcement for adobe walls. In Peralillo, they developed eight projects using this technique, also implementing their "school-workshop" methodology which prioritised hiring community members and using each project as a training opportunity for them, thus increasing local capacity (figg. 44–45).

Their work was highly praised, and the organisation continued working in the region as consultants for the restoration of the *Hacienda el Huique* Museum, one of the largest remaining *Haciendas* in the O'Higgins Region, which suffered considerable damage during the 2010 earthquake.[40]

Technical solutions in San Pedro de Alcántara were framed within the town's available resources and limitations. First, being a designated area meant that demolition – total or partial – would only be approved as a last resource by CMN. Emphasis was then put on repair work, and only four cases required new construction.

The use of traditional materials was also required by CMN. Reusing available elements – such as windows, doors, pillars, clay roof tiles, etc. – was prioritised over new ones when possible, and new materials could only be employed on interiors or when traditional ones were unavailable. An exception was made for cement stucco, since at the time there was no consensus over how compatible this material was. Some solutions included quicklime to allow the cement to "breathe", and others specified that the layer applied would not exceed 1cm (0.39 inches).

As for reinforcement solutions, the town's distance from large cities made it necessary to use materials that were available in most hardware depots on a regular basis, since "buying in bulk" was not an option for homeowners or small local contractors. The most utilised material was electro-welded mesh – used commonly for reinforced concrete walls, floors, foundations, etc. – which is easy to transport, store and install.

Images, Clockwise from top left: Figg. 46–48
Example of the process of installing electro-welded mesh as reinforcement for adobe houses of the town of Lolol. (courtesy of SEREMI MINVU, 2013)

The technical solution entailed removing all wall rendering to expose the adobe bricks, onto which the metal mesh was installed on both sides of the wall to create a continuous envelope, and anchored to a horizontal timber beam at the top of the wall (*viga de coronación*) and – when necessary – to a timber beam inserted at the base of the wall. Perforations were made in the wall through which metal connectors were introduced to secure the mesh on both sides. A first layer of mud plaster is then applied, to ensure the verticality of the wall, followed by a second layer of fine mud plaster, or in some cases cement (figg. 46–48).

Since this technique was relatively simple to implement, it was quickly adopted by contractors and homeowners in many of the towns participating in the Heritage Rebuilding Programme. It was one of the techniques that was feasible in all locations, regardless of how isolated or well-connected it was, and was financially plausible for a group of projects as well as for individual ones.

As for water damage, the relocation of the town to higher grounds after the 1900 flood has prevented such events from happening again, which added to houses being built on stone or concrete platforms (*zócalos*) to adapt to the slope of the terrain and has protected them from damage by capillary moisture. However, a significant number of houses suffered damage caused by roof leaks.[41] This required thorough inspections to determine what work needed to be done, but in most cases only damaged roof components needed replacing, and new components were incorporated to improve the structural resistance and to comply with current safety standards.[42] More severe cases required the entire roof to be replaced.

5. The Outcomes and Effects

By 2014, the Heritage Rebuilding Programme had been implemented in 140 towns or cities within five regions,[43] with 5,463 subsidies granted for a total of US$92 million (MINVU 2014). A number of public–private partnerships had been created, and collaboration between government agencies resulted in a series of complementary investments that not only rebuilt homes, but also boosted growth and improved quality of life.

During this final year of implementation, a preliminary analysis was done by the ministry to identify the main challenges and contributions made by it. This allowed for a series of conclusions to be drawn, that could inform future rebuilding efforts:

- Because the areas more affected by the earthquake were scattered in the territory, standard social housing solutions were not applicable, therefore individual projects needed to be developed. This resulted in adjusted timeframes and new strategies for lowering costs, such as using local contractors and purchasing from local vendors. Other necessary modifications needed to implement this programme and preserve small scale vernacular architecture included: changes in the ministry's administrative processes, allowing adjustments to the project during construction, having specialised professionals for inspections, and expediting payments to contractors and/or homeowners.

  These adjustments not only demonstrated that the housing ministry – and housing subsidies – could in fact move away from standardised design and work from a local perspective, but also proved that this institution can be a relevant participant in the conservation and enhancement of architectural heritage.

- The lack of a Chilean building code for adobe was singled out as the main challenge while designing and implementing this rebuilding programme. Although a series of strategies was developed to overcome this issue during its years of implementation – see section 4.4 – a unified

structural criterion for interventions was needed on a permanent basis. By May of 2014, two new building regulations for adobe had been published: NT002, published by MINVU to provide basic criteria to evaluate an existing adobe structure; and Nch 3332, published by the National Association of Engineers to provide standard calculations for the reinforcement of adobe structures and also basic criteria on materials compatibility and design.

Although they were not available for the development of projects on this programme, they are an invaluable tool for preparing and responding to the next earthquake.[44]

- The abandonment of building tradition after the 1985 earthquake resulted in a shortage of architects, engineers, contractors and manpower with knowledge of adobe structures. This made the process of project design and construction slower than expected, more expensive in some cases, and vulnerable to setbacks due to the inexperience of consultants.

  However, this also transformed the Heritage Rebuilding Programme into an opportunity to train local contractors and professionals in techniques to repair and reinforce earthen architecture, and to educate owners about suitable maintenance and intervention criteria for this type of building. It also provided a platform to implement and promote new restoration and reinforcement techniques for adobe structures, as well as protecting tradition.

  Teams of trained professionals who were aware of the importance of preservation and its role in community development, cultural identity and social stability were also created within the ministry

- Protecting historic neighbourhoods and towns can be a social stabiliser, preserve cultural identity and build resiliency. By rebuilding on the original sites and focusing on liveability rather than merely prioritising architectural value, the Heritage Rebuilding Programme helped maintain the residential use of properties, protect the social fabric of historic towns and prevent displacement.

A number of projects and ideas arose from this analysis, especially concerning the internal organisation of the ministry and intersections with other programmes. A new department within the Ministry's Urban Development Division was created to focus on heritage preservation and historic sites, with representatives from each region meeting to discuss challenges and share experiences. This department would work transversally with all the ministry's divisions, as well as collaborate with other government agencies to identify funding sources and project overlap. Unfortunately, this initiative was short lived, and other projects did not materialise (Scarella 2018).

In November 2013, the centre-left coalition (*Nueva Mayoría*) won the presidential election and assumed office in March 2014. The programmes created for the rebuilding process were wrapped up, but none were renewed or reformulated to become permanent policy. The concept of heritage being an active part of housing policies was dropped, and the teams and operational structures created were dismantled and absorbed by other departments.

Although the housing ministry has been working in the past years on developing housing subsidies for rural and heritage areas and compiling the testimony of former government officials who worked on the rebuilding processes, it remains to be seen how these initiatives will be implemented by local governments and communities to protect their homes and prepare for the next earthquake. The recent creation of a Ministry of Culture has opened a door for introducing disaster preparedness as a key element for heritage conservation, but specific policies and permanent programmes are yet to be announced.[45]

5.1 San Pedro's Experience

The experience of San Pedro de Alcántara provides a number of key considerations when discussing approaches to rebuilding in a rural area with historic significance:

- Access to information and resources is critical when implementing a rebuilding programme or policy in rural areas. Channels of communication differ from what is available in large cities, therefore strategies for transmitting information must be adapted. In the case of San Pedro, the field work done by the local government, consultants and government agencies was essential for the participation of the community in the Heritage Rebuilding Programme. Workshops and community meetings played a significant role in keeping people informed and helping to solve issues, as well as supporting community leadership that could channel concerns and good practices.

- Residents of San Pedro were – and still are – unlikely to rebuild unless supported technically, financially and administratively. The inclusion of an active form of advising and monitoring was key to implementing the Heritage Rebuilding Programme, and it allowed the SEREMI team to have a more comprehensive idea of the needs and desires of the community, thereby optimising resources and time. The existence of this team also allowed for learning to be shared between town and communities, thereby promoting continuous improvement to the programme.

- Having simplified administrative processes proved especially relevant in San Pedro. Considering that laws and policies are predominantly developed with the needs and resources of urban areas in mind, it is not surprising that some of them are detrimental or inapplicable to rural environments. Abbreviating the design review process conducted by CMN – see section 1.3 and section 4.6.3 – allowed construction to begin sooner, and new building permits – see section 4.4 – made adobe restoration projects eligible for housing subsidies.

- Community organising and local leadership are crucial elements when facing natural disaster or other kinds of crisis in a rural environment. For the Heritage Rebuilding Programme, the work done by the community liaisons was not consolidated or sustained over time. Although the mayor was/is identified as a figure of authority, emphasis needs to be put on supporting and strengthening community organising. The rebuilding process of San Pedro required an identifiable local counterpart to be implemented, as will any other policy or programme for disaster preparedness.

This also applies for local government capacity. Small municipalities such as Paredones have limited resources and struggle to meet the community's needs. The development of the municipality's capacity needs to be prioritised in order for it to play an active role in future policies and programmes that address disaster management. This is especially so since a number of current funding opportunities are only accessible through local government.[46]

- The life-cycle of rural vernacular architecture in Chile always included maintenance work, which in some cases involved culturally significant social interactions.[47] Over the years, due to social and cultural changes, many homeowners did not know how to properly maintain their houses, resulting in the damage seen after the 2010 earthquake. The Heritage Rebuilding Programme was an educational experience for all those involved and helped revitalise building tradition and craftsmanship. There are still many homeowners, however, who still do not know how to maintain or alter adobe structures. This implies that future maintenance work still needs technical assistance, and that further training is necessary.

- Owner participation in all stages of this programme helped promote a sense of personal responsibility towards the maintenance of adobe houses. Learning from experience about the requirements and limitations of the work needed, costs and timeframe, allowed homeowners to utilise their resources more efficiently. It also prepared them for the next stages, now with more tools and a different perspective. Many were able to continue repairing and improving their homes over the next few years, and some even sought out sources for funding. Overall, there was a sense of a "work in progress" rather than "unfinished work".

- Disaster management is a cycle with different phases and goals. As Bernard Feilden eloquently stated <<we are living between two earthquakes>>, so our programmes and policies should reflect that. The time and resources invested in developing a reconstruction programmes like the Heritage Rebuilding Programme is not sustainable if it needs to be recreated every two or three years. San Pedro's residents unanimously agree on the need to have a permanent programme to support maintenance work, and to which participating professionals would add emergency, reconstruction and preparation stages, thereby increasing resilience. This would reduce the time needed to recover from disasters and for preparing for the next one.

6. Additional Comments

The implementation of Chile's Heritage Rebuilding Programme after the 2010 earthquake proved that vernacular architecture is a feasible subject for housing subsidies, and that its preservation requires innovation as much as it needs to reclaim building traditions. It also showed, however, that existing tools and regulations are inadequate for addressing the issues that rural areas face.

Land use regulations are developed only for urban areas. Preservation tools are valued in urban built environments, but struggle to effectively protect rural landscapes. Disaster management plans have mostly focused on technical aspects, failing to envision the long-term consequences of these events in ecosystems that were fragile to begin with.

Those of us involved in these processes acknowledge the need to approach planning, preservation and disaster management from a regional and more inclusive perspective that considers the needs of different geographies and landscapes.

Analysing and sharing experiences such as San Pedro's are unique opportunities to steer the dialogue about how to develop new strategies for addressing rural areas from a holistic perspective, identifying what are the values, codes and dynamics that shape these communities, and how those elements are harboured by the built environment.

San Pedro's community is proof that disasters can be an opportunity, and preservation is not the opposite of development. Residents proudly refer to their town as <<important because we are part of our country's heritage>> and work together to protect it. Even with limited tools and resources, this community's experience is a tangible example that this is not a utopia, but a viable option on how to prepare and deal with the next disaster.

7. Details of the Expert(s) Completing the Case Study

Maria de los Angeles Muñoz is a Chilean Architect and preservationist specialised in earthen structures, with a professional focus on community development and social equity. She has worked in the public and private sector, most notably in the Ministry of Housing and Urban Development where she was Regional Heritage Manager for the 2010 rebuilding process. She holds a professional degree in architecture from Universidad de Chile, and an MSc in Historic Preservation from Pratt Institute. She received a Fulbright scholarship for her graduate studies, and a grant from Chile's Ministry of Culture for her thesis on the rebuilding process of rural areas.

Notes

1. This event is known by historians as "The Destruction of the Seven Cities" (*La Destrucción de las Siete Ciudades*) where seven of the major Spanish outposts in southern Chile were destroyed or abandoned due to the Mapuche and Huilliche uprising of 1598. It is considered as the end of the Conquest period, and the beginning of the Colonisation period. (Guarda 1978).

2. *Encomiendas* were a Spanish labour system, where the Crown granted conquerors a specified number of natives as labour. In return, the *Encomendero* would provide infrastructure, instruction on the Catholic faith and in the Spanish language, as well as protection against warring tribes or other threats.(Guarda 1978; Lockhart and Schwartz 1983).

3. Land grants, known in Chile as *mercedes de tierra*, were a legal institution used by the Spanish Crown to award land to nearly any Spaniard who migrated to the Americas during the fifteenth and sixteenth centuries. It was used as an incentive to colonise the conquered land, and soon the estates rivalled those of the *Encomenderos*, despite them not receiving Natives or any labour as part of the grant.(Lockhart and Schwartz 1983).

4. The Royal Hearing (*Real Audiencia*) was the highest judicial court of appeal in the Indies, as it had civil and criminal jurisdiction and extensive jurisdiction extended even to the ecclesiastical field. The creation of the Indian Audiences had as its main objective to reaffirm the supremacy of the justice of the king over that of the governors. The first Indian Hearing was established in Santo Domingo in 1511. From 1527 until 1563, the founding of new audiences in Mexico, Panama, Guatemala, Lima, Guadalajara, Santa Fe, Charcas, Quito and Chile marked the process of colonisation and monarchical power in America.(Rosati n.d.).

5. The founding of a Chaplaincy (*Capellanía de Misa*) was a very common practice during the Colonial period in Latin America. A person, the founder, donated a fund to support a chaplain and said chaplain would have the obligation to say a certain number of masses on behalf of the founder and/or those he/she designated as beneficiary. *Capellanías* were designed to be perpetual: the chaplain's obligations were transferable and the funds were based on revenues, not capital. They served a religious purpose, but also had economic and social functions since the chaplains in charge of them could be ordained through them and receive a life-time income.(Wobeser 1998).

6. *Primicias* (first fruits) became a significant part of the Catholic Church finances, especially in rural areas, and were in use until well into the nineteenth-century.

7. Chile gained its independence from Spain in 1818, although the process started in 1810 and was finalised in 1823. The following years were dedicated to organising and consolidating the Republic, ending with a civil war and the establishment of the Conservative Republic in 1930.

8. *Decreto de Ley 615 de 1925*. This decree established three categories of monuments (Historic Monuments, Public Monuments and Archaeological Excavations), created a registry for museums, and established a technical agency for the protection and tuition of monumental heritage: the National Monuments Council.

9. Law 17.288, Titles III, IV, V, VI and VII.

10. The Ministry of Culture, Arts and Heritage was only created in 2017. Previously, and since its creation, the Council was under the jurisdiction of the Ministry of Education, with an Executive Secretariat created in 1994 that allowed for a certain level of administrative autonomy.

11. Council members are representatives of different public and private organisations. Although each one is free to determine who will be their representative, in some cases the law specifies the position that the Council member must have in said organisation.

12. Frequency of the sessions is not determined by law, except a minimum of attendance for its members (once a month).

13. Decree 17.813, November of 1972.

14. Decree 106, January of 1974.

15. Decree 390, July of 1996.

16. Some complementary laws have been created to provide tax credits for donations to eligible projects on designated sites (*Ley de Donaciones con Fines Culturales*, Law 18.895, Article 8), and land tax exemptions are available for residential properties (DFL 119, 1953).

17. Law 17.288, Title III, Art. 11, 12 and 30.

18 The legitimacy of these attributions has been questioned for many years, since its effects on property rights have been deemed unconstitutional (Skoknic 2015).

19 At any of these stages, modifications or supplementary information can be required, which will restart the process. The law doesn't establish a timeframe for it, but administrative processes have a deadline of three months each. This deadline only applies for each administrative process, meaning that after the dossier is submitted, the Council has three months to either request more information or to inform a decision about the project. Any response from the applicant afterwards is considered a new administrative process, thus starting a new three-month deadline.

20 In the O'Higgins Region: Guacarhue's historic center, *El Huique* Hacienda, San Pedro de Alcántara's historic center, town of Zúñiga, and Lolol's historic center. In the Maule Region: town of Vichuquén, Villa Alegre's historic center, town of Nirivilo, Yerbas Buenas' historic center, town of Chanco. In the Biobío Region: Cobquecura's historic centre.

21 General criteria were sent by CMN as an official letter on 30 December 2010 (Ord. 6305/10). The protocol was finalised and signed by CMN and MINVU in January of 2011 (Ord. 402/11).

22 According to the 2017 census, *Paredones* has 70.2 per cent of its population living in rural areas. The national percentage is only 12.2 per cent.

23 The town of *Lolol* is also a Typical Area protected by the National Monument's Law. Designated in 2003, it was the third rural area in the region to receive legal protection. Unlike *San Pedro de Alcantara*, *Lolol* has received public and private investments to preserve its architectural features and develop tourism over the years and has been the focus of scholarly research. There are multiple reasons for this, but the main one mentioned by different stakeholders has been connectivity. *Lolol* has always been more accessible than San Pedro.

24 During July of 2018, the author conducted a series of interviews with the community as part of her research for her Master's Degree Thesis.

25 According to data from the 2017 census, activities related to mining, communications, finances, professional and technical services, arts and entertainment, and organisations exist in small percentages in Paredones, but are nonexistent in San Pedro.

26 According to statistics from the Ministry of Social Development, in Chile 8.5 per cent of elder adults live in poverty. Government pensions for people who don't have access to retirement plans are US$167 a month, which is barely 40 per cent of what is established as the minimum wage in Chile (US$450 a month).

27 Law 17.288 of 1970.

28 Art. 60 of the General Law for Building and Urban Design (LGUC).

29 The town of *Chanco*, in the Maule Region, was designated as a Typical Area in the year 2000. Two weeks after the earthquake, the municipality began to demolish damaged houses without authorisation or evaluation by the National Monuments Council. Other historic towns in the O'Higgins Region also suffered from unnecessary demolitions, especially those without any legal protection. Preservationists called the phenomenon "the second earthquake", which caused more losses to the historic fabric than the first one.

30 At the time of the earthquake, most of the affected areas in the central valley didn't have any legal protection or acknowledgement of their historic value, and design guidelines were scarce. This made it very difficult for any government policy that included historic value to be implemented in enough areas to be considered representative. Since utilising existing designation alternatives was out of the question because of incompatible timeframes and resources available, a new category was created to make the Heritage Rebuilding Program feasible: the Heritage Value Areas (AVP).

Since this new area designation was created specifically for the purposes of accessing subsidies, there were no permanent regulations required to be followed by owners. If they chose to apply to a subsidy from the Heritage Rebuilding Programme, the amount of funds for design and construction would be higher and they would have a specific project for their home. If not, they could access any of the regular subsidy programmes with standard designs and requirements, but with a smaller budget.

As for the design criteria for these areas, a list of characteristics called "Heritage Values" (Valores Patrimoniales) was established by the SEREMI Team after a period of research, site visits and collaboration with local stakeholders. The

inventory made by the O'Higgins' team was also used by the Maule Region's team, but other regions created their own.

31 General Ordinance for Urban Planning and Construction (OGUC), Articles 5.1.25 and 5.1.27.

32 This building code was published officially in 2013 as "NCh 3332 Structural design – Retrofitting of historic earth buildings – Requirements for the structural design planning". The same year, the Housing Ministry published a simplified version as "NTM 002 – Establishes conditions for structural intervention of earthen structures".

33 Urban Development Division (*División de Desarrollo Urbano*) Circular 2011/242, 2011/245, 2012/248 and 2014/276.

34 In 2010 a new category was created for emergency work and heritage rebuilding.

35 Housing subsidies establish as mandatory for any project the construction of a kitchen, one bathroom, two bedrooms and a living/dining room. Since these criteria wasn't applicable to repair projects, exceptions were given to the projects in the Heritage Rebuilding Program.

36 An important element to consider was that adobe manufacturing and construction is a seasonal process. The work is done mostly during warm seasons (Chile's spring and summer) and is halted during cold or rainy seasons (Chile's winter), causing delays not usually seen on projects that use contemporary materials.

37 The full document can be found at http://admminvuv57.minvu.cl/incjs/download.aspx?glb_cod_ nodo=20110311113300&hdd_nom_archivo=Lineamientos per cent 20de per cent 20San per cent 20Pedro per cent 20de per cent 20Alc per cent C3 per cent A1ntara.pdf (in Spanish).

38 Houses in San Pedro averaged 4,000 ft^2, and restoration projects averaged 1,000 ft^2. Basic living spaces needed to be included in the project funded through the subsidy, thus guaranteeing liveability. However, still a large part of some properties remains untouched, with families having to adjust to the available space.

39 According to a survey done in July of 2018, 64 per cent of the residents of San Pedro's Typical Area are older adults, 52 per cent live alone or with a spouse, 84 per cent are retired, all own their property and 64 per cent have lived there all their life. (Munoz, Maria de los Angeles 2019).

40 *Hacienda San José del Carmen el Huique* was designated a National Monument in 1971, and its surrounding houses were designated as a Typical Area in 1996. Both of them are currently in Chile's tentative list for nomination as World Heritage Sites.

41 During the 1985 earthquake, a number of deaths were caused by clay shingles falling on people's heads. Motivated by the fear of this happening again, homeowners started removing clay tiles and replacing them with galvanised steel or asphalt roof panels. This not only affected the overall seismic resistance of adobe houses but contributed to the change in the culture of maintaining them.

42 In general, bracing diagonals between beams were included as well as fire-resistant and water barriers. Clay tiles were reinstalled when necessary, tied together with wire.

43 The IX Region, Araucanía, didn't participate in the Heritage Rebuilding Program.

44   In February 2020, a new complementary regulation was published by the National Association of Engineers: NCh 3389 Seismic Stabilization of Historical and Existing Buildings - Requirements for the Structural Design.

45 In 2019, the Housing Ministry launched a new subsidy for home and neighborhood improvements that included an increase for designated historic areas (DS27). A pilot was announced to be implemented in the Coquimbo region.

46 A Rural Housing Subsidy was launched in 2015 by the Housing Ministry. It was designed to <<solve the housing and environment needs of families living in rural locations in which the Ministry has a lower presence, or where it has a limited portfolio of projects, mainly in those territories with significant degrees of geographic isolation.>> Among its requirements is that applications can only be done through a "Rural Management Entity". These entities can be private, or Municipalities can act as them.

47 For example, Chile's Independence Day is September 18th – the last days of winter – and includes festivals and parades. Historically, homeowners prepared for this day by painting their houses with quicklime, a material that was inexpensive and protected adobe from water damage during the winter. This tradition has somehow been lost, with newer materials becoming more common and affecting how adobe structures are maintained.

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FLOOD PROTECTION PROVISIONS IN THE WORLD HERITAGE CULTURAL LANDSCAPE WACHAU, FOLLOWING THE FLOOD OF 2002

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1. The Heritage Resource and Its Context Before the Impacting Event

1.1. Description, Designation and Recognition

The World Heritage cultural landscape of Wachau in Lower Austria is a riverine landscape along the Danube. Generally, the Danube in south-eastern Bavaria and most of Austria follows the southern fringe of the medium high mountains that make up the so-called Bohemian Massif. On some occasions, though, it runs through the mountain range, cutting off small parts and creating scenic valleys.

The peaks along the Danube in the Wachau are usually around 500 m above the sea level of the river, which in turn is about 200 m above the sea. The location between two large climate zones – Atlantic and Continental – and the specific features of the landscape – aspect, geology, sunshine hours – have created a landscape which features many rare warmth-loving animals and plants and a certain Mediterranean flair which is unique in Austria.

The Roman Empire used the Danube as its northern border and introduced wine growing in the region.

During the Middle Ages, monasteries upstream colonialised the Wachau as their major wine growing area. Wine growing still accounts for about two thirds of the landscape, on dry stone terraces cultivated and maintained mostly manually. Despite the economically challenging way of working, the wine growing area has stayed constant during the last 50 years. White wines from the Wachau rank among the best worldwide and achieve prices which allow the wine growers to continue working and make a reasonable living out of it on the historic terraces.

The Wachau valley was already designated as a Protected Landscape under the Lower Austrian Nature Protection Act in 1955. In the 1970s, a large citizen movement successfully opposed plans to destroy the landscape by building a hydroelectrical power plant opposite the medieval town of Dürnstein. Since 1994, it has been awarded the European Diploma for Protected Areas by the Council of Europe under the condition that all plans for such a power plant are banned forever. Subsequently, the Wachau was enlisted as a cultural landscape into UNESCO's World Heritage List in 2000 (fig. 1).
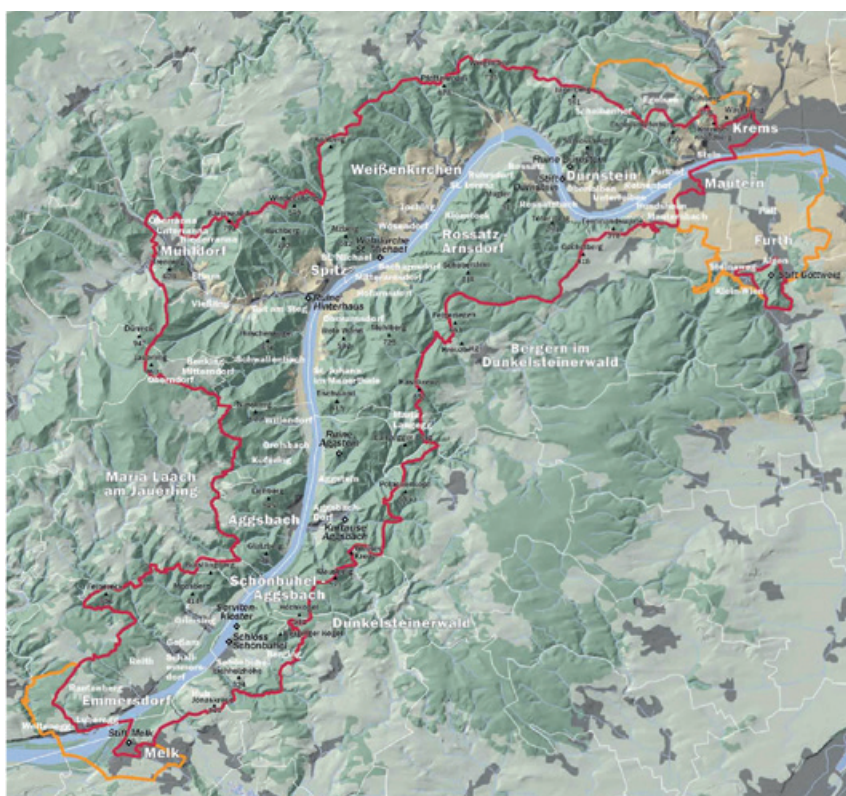
▶
Fig. 1. The World Heritage region Wachau, in: *Zech et al.* 2017, 24-25

Today, the Wachau is commonly described as the part of the Danube valley which starts and ends at the cities of Melk and Krems. It is framed by two famous baroque monasteries – Melk and Göttweig – and is about 36 km long. At least a part of the World Heritage perimeter is held by fifteen different municipalities. They are organised in a voluntary association which has been assigned the task of managing the World Heritage status in the World Heritage Management Plan which was issued in 2016. The association currently employs five people who are responsible for protecting and carefully developing the region. The management is jointly financed by the Republic of Austria, the Federal State of Lower Austria and the municipalities. For specific projects, it makes use of a wide variety of national and European grant schemes.

1.2. History and Context

Like any river in the world, the people living close to the Danube have witnessed a number of smaller and higher floods during their lives. Many towns and villages in the Wachau valley are located so that they are safe from flood risk, or at least from minor events, except for some villages which served as harbour cities which were therefore flooded more frequently.

Really big flood events were a rare occurrence. The biggest flood in recent history was the flood around 15 August 1501. Calculations from the 1930s estimated the peak flow of this event at around 14,000 m³/s in the town of Krems-Stein.[1] As a comparison: Currently, the average flow of water (MQ) in the Danube in the Wachau is at 1,880 m³/s, the average lowest flow during the last 10 years amounts to 812 m³/s.[2]

Around 1800, there were again a number of rather large floods, such as in 1787, 1830, and 1862, partly caused by ice jams (see fig. 2).[3] At the same time, the use of the Danube followed the industrialisation of society, meaning the river should become more reliable for navigation and at the same time safer for the local people in the event of a flood. This is why the Danube in Austria was, as it was called, "regulated" (*reguliert*) during the second half of the nineteenth-century, which mostly meant cutting off side branches, putting the water into one rectified river bed and securing the banks with big rocks.

At some places, people became a little careless, building closer to the river than they should have. However, it soon became clear that floods would still be a regular part of their life. Both 1897 and especially 1899 saw large floods putting wide parts of the newly built areas under water. The next huge flood only took place in 1954, with the water levels rising to the same height as those in the nineteenth-century.

◄

Fig. 2. M. Schimek, 2019, Flood marks at the house Oberarnsdorf 16
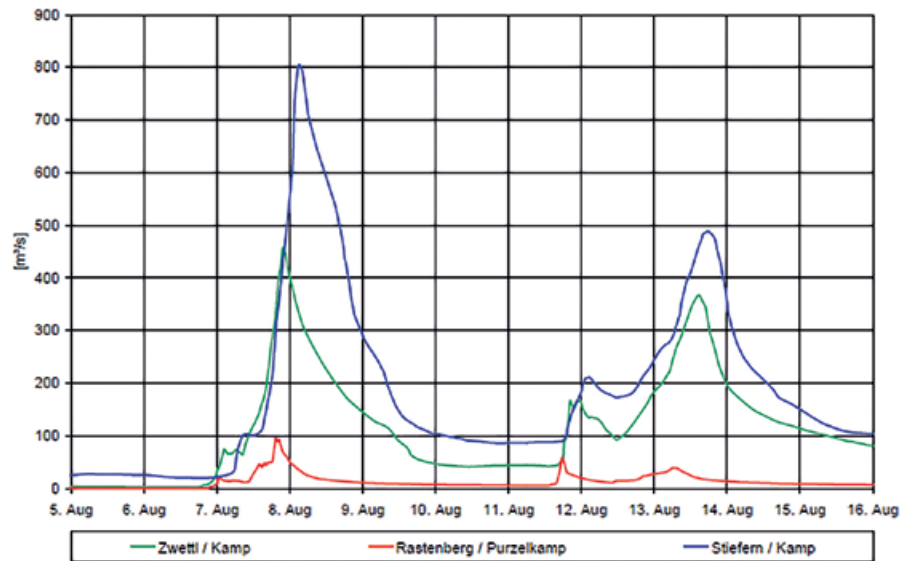
After that, circumstances changed once again. Between 1956 and 1998, a total of ten hydroelectric power dams were built in the Austrian Danube.[4] There are now only two stretches of the Austrian Danube where the water is not dammed: The Wachau, now a UNESCO World Heritage, and the part between Vienna and Bratislava, now a National Park. Both the opportunities of the newly created retaining capacities behind the power dams and the necessities of proper gravel management – the rubble transport of the Danube is blocked by the power dams now and only takes place in the freely flowing river sections, resulting in gravel accumulation where the freely flowing river ends and the dammed-up areas start – had to be tested out.

This is why the effects of the flood in August 1991 turned out to be more severe than expected in the case of the historic city of Stein. During the building of the downstream power dam at Altenwörth, along the city of Stein a wall had been erected which kept smaller floods away from the city. In this case, because of gravel accumulations and the late reduction of the water level at Altenwörth, they were almost a metre too low,[5] though, so the flood severely damaged the historic city.

This is why the municipality of Krems (to which Stein belongs) decided to build a higher flood protection system following the role model of the City of Cologne in Germany, which had built a special form of flood protection infrastructure during the 1980s.[6] In case of danger, aluminium panels can be mounted on top of relatively low walls following the riverbed and which have little influence on the perception of the townscape of the old town of Cologne. The new flood protection system for Krems and Stein was completed in 1996, at a cost of about €12 million (ATS165 million). It runs over a length of 1.69 km, out of which about half is constructed in the same way as the one in Cologne (the remaining part, aside from the historic city centre, is made up by dams and permanent walls).[7]

2. The Nature of the Impacting Event

2.1. The Hydrological Aspects of the Flood

The year 2002 brought a number of flood events all over Austria. In the case of the Wachau, in March there was a medium-sized flood which came close to the extent of the flood from 1991.[8] But this was overshadowed by the enormous flood that hit parts of Austria – the same flood hit western Czech Republic and northeastern Germany – in August 2002.

In the end, it was two events within a week that caused the enormous impact of the flood in the Wachau in August 2002. The first event took place on 6 and 7 August. 2002. Extremely heavy rainfall north of the Danube – in some places there was almost three times as much rain in 48 hours than there usually was for the whole month of August[9] – caused a 1000-yearly flood (fig. 3) in some places.
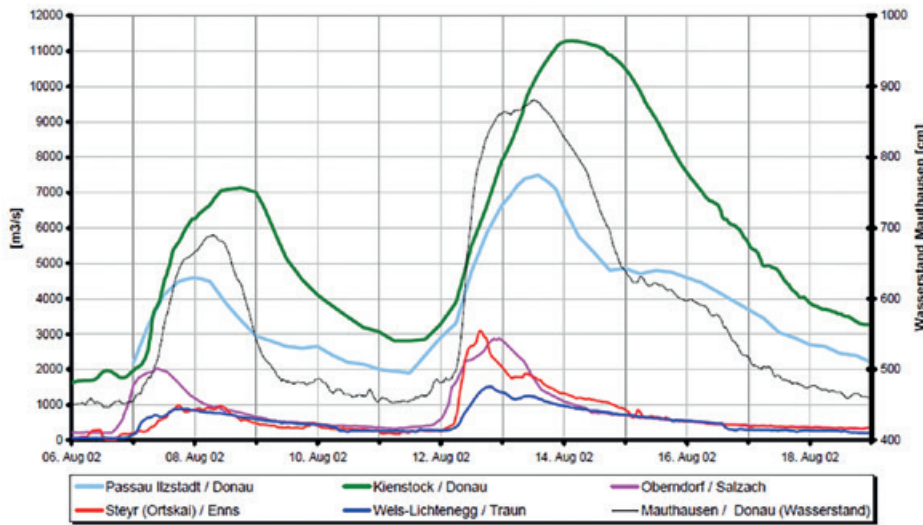
From top to bottom:
Fig. 4. The August 2002 flood on the Danube, in: Godina *et al.* 2004, 32
Fig. 5. Flood levels in August 2002 from the Wachau downwards, in: Godina *et al.* 2004, 33
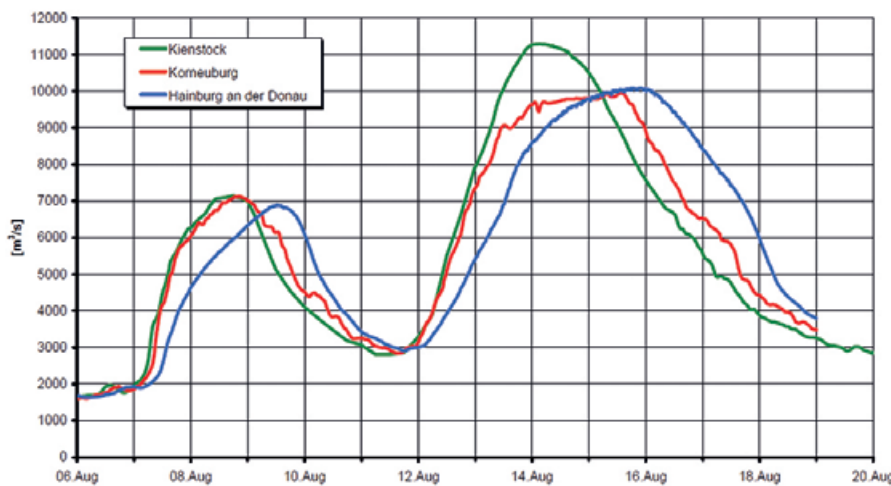
Dams along the rivers broke, wide areas in the flatlands were flooded. Initially the situation seemed to improve, but then between 11 and 13 August there was again heavy rainfall, this time not only north of the Danube, but also in the Alps, especially in Salzburg, Upper Styria, and Upper Austria, causing extreme floods along the main tributaries of the Danube in this area, for example, Salzach, Traun, Enns, and Ybbs. This second flood wave built on the already high water levels from the first flood wave, causing the highest water levels in 200 years.

For the Wachau, it proved crucial that the highest floods on the tributaries happened on rivers entering the Danube rather close to the valley. In many cases, floods on the Danube have to do with extreme precipitation events along the Bavarian Danube and its tributaries, for

example particularly on the Inn River. In August 2002, the most extreme floods happened more to the east of Austria. The enormous influx from the Enns River showed that the water level rose from 5 m to more than 8 m within just a few hours on 12 August on the water level metre of the Danube at Mauthausen, opposite the mouth of the Enns into the Danube (fig. 4).

This is why a flood which was only classified as a 30-yearly event until Mauthausen had become a 100-yearly flood from Mauthausen to Vienna.[10] For the Wachau, this meant the worst flood since 1954. Because of the nature of the event, the flood came relatively quickly. It only took about 36 hours from reaching basic flood level at a flow level of 5,150 m³/s[11] to the peak at 11,300 m³/s (fig. 5).[12]

2.2. Lack of Practical Experience with a 100-yearly Flood

This meant relatively little time to prepare the villages for the unavoidable. Added to this was the fact that at that time, the official forecasts were only prepared for a few hours ahead, which meant that the anticipated peak level of the flood was constantly raised with any new forecast. There were unofficial reports that precisely forecast the final peak level, but they were not officially communicated, probably because of fear of liability issues. This meant that many people checking the forecasts themselves on the internet lost precious time to safeguard their properties since they first believed that they would not be affected at all.

Furthermore, as this was the first really big flood in almost 50 years, not many of the people in charge in 2002 had already witnessed the 1954 event. Operation plans for the blue light organisations had not been updated for a long time. People had become careless, using lower-lying parts of their house as living spaces or for storage of valuable items. Many house owners had installed central heating since 1954, usually in places that were flooded this time. In particular broken oil tanks proved to be an additional hazard.

2.3. Damage Witnessed

In the end, the flood waters rose as high as 3 metres or in some places even higher, which in these cases meant that the water reached the second floor of the houses (fig. 6). In most cases, though, the local residents could stay on the second floor of their houses but had to be supplied with food and drinking water from fire brigades on boats. None of the flooded houses collapsed, since generally speaking the historic buildings are built in a way that they survive a few days in the water – many old houses use Danube stones in the lower part of the wall construction, which means that they do not soak up the water, timber structures in the walls are extremely rare – but of course a lot of the interior fabric was severely damaged.

The most severe damage occurred to one of the most important features of the World Heritage cultural landscape, the traditional dry stone wall wine terraces, many of them dating back almost 1,000 years and still successfully maintained for wine production (fig. 7). Because of the extreme rainfall, 150,000 m² of them had been severely damaged or had even collapsed. Recovery of the terraces started immediately after the flood but, of course, this took longer than cleaning up the houses and streets.

The only town which was not flooded in 2002, though, was Krems-Stein, since they had already built a new flood protection facility after the flood of 1991. Although the aluminium panels screwed to the top of the base walls proved to be too low, the fire brigade and local people managed to put enough bags of sand on top of the aluminium walls to keep the water out of the city.

▶

From left to right:
Fig. 6. M. Schimek, 2019, Flood marks inside Gasthaus Reiböck in Spitz – the house itself is raised about a meter above street level
Fig. 7. M. Schimek, 2006, Dry stone walls still are the backbone of wine production in the Wachau

3. Post-Event Appraisals

Apart from the immediate recovery and help to the affected people, thoughts centred around ideas on what to do in the future, if a similar event happened again.

A week after the flood, the head of the region and mayor of Spitz, Dr Hannes Hirtzberger, was invited onto a TV show where he postulated that the public sector had to accept floods like these and fully compensate all affected owners in the future. This was not very well received by a lot of the local people, but especially by the Governor of Lower Austria. Even though it was merely pure luck, the example of Krems-Stein avoiding devastation in their town by technical means, was perceived as a great success and a role model for the future.

Hirtzberger stressed the fact that technical infrastructure alone would never provide 100 per cent security, which means that people might become careless again, and he was afraid that the recently acquired World Heritage status might be jeopardised by major constructions significantly altering the landscape. Not all the other mayors in the Wachau held the same opinion. In particular, the mayor of Weißenkirchen publicly called for additional flood protection systems. The Lower Austrian government offered those who were ready to invest in such a system additional money – 50 per cent of the cost from the Republic of Austria, 37.5 per cent from the State of Lower Austria, and only 12.5 per cent from the municipalities,[13] all of them small communities of between 1,500 and 3,000 inhabitants. Plans for a potential flood protection system had already been drafted in the 1990s for all the affected villages, so the calls for a more detailed planning and implementation of those plans became louder and louder.

In the end, Hirtzberger agreed on more detailed planning, but he made almost all of the other mayors agree on common rules for the future flood protection systems. If possible, they should all follow the example of Krems-Stein, i.e. construct a relatively low wall of about 80 cm in height which would in many cases replace the similarly high guard rails along the roads (fig. 8), and put aluminium panels on top only when they were needed (figg. 9, 10). Thus, the high water is kept behind the system in the riverbed creating a dry polder inside.[14]

Most of the infrastructure is not visible, though. The walls that show 80 cm above the surface need to be grounded some metres deep in order to prevent ground water from intruding into the polder (fig. 11). Since a certain amount of influx into the ground water body still needs to be possible, not all ground water can be blocked. The remaining water, therefore, has to be pumped out of the polder during the flood. For this a number of pump houses had to be built. The decision was taken to put all those pump houses underground, so that they did not intrude on the landscape. The only visible sign of the pump houses usually is a strange array of locks on the street surface (fig. 12).

All drafts should not only be done by technical planners, but also by a professional architect watching over the aesthetical appearance of the walls and additional infrastructure necessary, such as the storage halls for the aluminium panels. The final decision on the details of the planned devices was taken by an advisory board that was composed not only of technicians, politicians, and the architect, but also a delegate from ICOMOS Austria. Since every decision had to take into account different conditions, they could not be taken at the same time, and since the same people were not involved in every single project (e.g. it was a free decision of each municipality to decide on the architect in charge), there was an advisory board for each village respectively.

The discussion process in the advisory board meetings tried to ensure that all necessary decisions were supported by all members of the boards, so if any doubts were raised by any member of the board, the current drafts were worked over to make sure that everybody could agree on the final solutions in the end. Only in exceptional cases, a majority vote took place, in which each of the board members (also the ICOMOS delegate) had one vote, following standard legal procedures for public commissions in Austria.

The local people of the affected villages were informed on a number of occasions in public meetings and had the opportunity to discuss the plans with the planners and their municipality representatives.

Images, Clockwise from top left:
Fig. 8. M. Schimek, 2019,
The base walls of the flood
protection systems should about
equal the height of the guard
rails along the main road
Fig. 9. R. Schütz, 2012, Trial
mounting of the flood protection
system at Oberarnsdorf
Fig. 10. P. Strobl, 2019,
Trial mounting of the flood
protection system near Melk
Fig. 11. R. Schütz, 2011, Grounding
of the walls near Rührsdorf
Fig. 12. M. Schimek, 2019, Location
of the pump house at Emmersdorf

They did not send any additional people to the advisory board, though. Since most of the affected municipalities have a population of around 1,500 people (the largest 5,500), the mayor and the other municipality representatives have a very close connection to their inhabitants and are, generally speaking, trusted by them. Since the mayors have no interest in public unrest, they tried to make sure that the ideas of the local people were taken into account as much as possible.

To allow for all necessary projects to be financed, the State of Lower Austria created a list of priorities for all municipalities. In this list, the projected costs were compared with the potential damage of a similar flood event like the one in 2002, thus creating a cost-utility-ratio for each village. This number made clear which plans create the highest utility if implemented – if the costs of building a flood protection system were potentially already covered by preventing the damage stemming from one or two similar floods (so creating a ratio of below or slightly above 1), those plans were prioritised first. The villages with a higher ratio had to accept that their systems would come later.

Since the different flood protection systems were built consecutively, each municipality learned from the examples erected before them. Some were luckier than others – since the rule was that the reconstruction of everything that had to be destroyed because of building underground – road surfaces, smaller green areas, but no valuable historic substance – was jointly financed by the Republic of Austria, the State of Lower Austria, and the municipality involved, some could do more for the new design of the affected places than others. It was the job of the architect to make sure that also these interventions are taken with respect to the World Heritage status of the region and the historic substance, in each case. In some cases, asphalted street surfaces were replaced by cobblestone. In any case, the modernised situation means that the public space is of a better quality in visual and useability terms for both the local people and visitors to the area.

As for the design of the walls, the decision was taken that they should be recognisable as a twenty-first-century intervention and not be designed in a historicising manner. This led to different aesthetic solutions, though, depending on which architect the municipality chose for the job (fig. 13).

◀

Fig. 13. M. Schimek, 2019, Different wall designs

4. Response Actions, Timeframes, Resources and Costs

4.1. Immediate Action

4.1.1. Cleaning Up

As the flood waters recede, they leave millions of cubic metres of mud in the houses, gardens, and on the streets. It is crucial to get rid of the mud as quickly as possible, since it gets solid and hard as concrete when it is drying out. Since almost all the affected houses were still inhabited, people had a huge interest in quickly making their houses inhabitable again, so they started cleaning up immediately and tried to make sure that the walls dried quickly. Wheelbarrows, snow shovels and drying devices for houses were sold out within hours.

The local residents were supported by fire brigades from neighbouring villages and the Austrian army who were sent to the flooded areas to help. In addition, thousands of volunteers from all over Austria supported the local people, many equipped with their own shovels and carts. Special trains from Vienna for volunteers were organised in cooperation with radio stations. The result was overwhelming: On the first weekend after the flood, so many people had come that the mayors had to ask the people who had not arrived yet to stay at home, since there was no way of dealing with them properly. The number of volunteers even outnumbered the number of inhabitants in some of the villages.

This is how the immediate cleaning up job was done within a week of the end of the flood everywhere. Drying the walls took a little longer, of course. The local people cooperated a lot in sharing machinery and supporting each other.

4.1.2. Financing the Recovery of Damaged Houses and Furniture

The Republic of Austria has set aside some of its revenue from income and corporate tax in a so-called Catastrophe Fund. It may be paid out to private households who have suffered from natural disasters.[15] The fund is administered by the federal states, which also have the right to issue procedures on how the money is assigned.[16]

In Lower Austria, money from the catastrophe fund is mainly paid out for damage to houses, agricultural land, and forests. For these cases, each municipality has to form commissions straight after the event who visit each affected household and record the amount of damage. These commissions include the mayor of the municipality, the head of the second largest political party delegation in the municipality council, and a number of certified experts, depending on the kind of properties affected. The commission agrees on the amount of damage and notes how much may be covered by private insurance.

It is then the job of the federal state administration to decide on the final amount of money paid out to the individual households. The general rule is that 20 per cent of the costs remaining after the deduction of private insurance payments are covered by the public. In case of socially disadvantaged people or other special circumstances, the amount may be raised to 50 per cent of the remaining costs.

One problem was that some of the house owners who live close to the river that are flooded more regularly, or suffer other minor events, no longer had private insurance since they could not afford the high annual insurance rates. This was one of the reasons for discussing ways of dealing with the situation in the case of similar floods in the future (see chapter 3).

4.1.3. Recovery of the Dry Stone Wall Terraces

Immediately after the catastrophic loss of the dry stone terraces because of the heavy rainfall, negotiations for additional public funding of their restoration started.

it was necessary to restore the terraces not only from a World Heritage point of view, but also to maintain the worldwide fame of wine growing in the Wachau. Luckily, the economically healthy and prosperous wine economy of the Wachau managed to afford the necessary restoration works.

So, by 2004, almost all of the collapsed or damaged walls had been rebuilt in the traditional dry stone style, using the original materials and technique which has proven to be the best possible way to build such terraces in order to grow wine on them. Most of the work was done by the wine growers themselves, in many cases supported by volunteers who were actively recruited by the region.

4.2. Preventive Actions from 2002 to 2013

4.2.1. Provisions for Civil Protection

Apart from the catastrophic nature of the flood itself in 2002, some of the problems arose from the fact that the Wachau had not witnessed a similar event for almost 50 years and the general circumstances had changed tremendously in between because of the building of the power dams upstream and downstream and the general alteration of the surroundings of the river that simply happen over a span of 50 years. This is why all the institutions involved thoroughly recorded all the shortcomings of the civil protection plans from 2002 and created significantly improved disaster response plans for the local people, the municipalities, the blue light organisations, especially the volunteer fire brigades run by the local people themselves, and the Austrian army specialises in helping out with inland disasters.

At the same time, the public authorities agreed on investing in a better forecasting model that would also provide the affected people with a forecast on the maximum height of a pending flood. The minor events following the 2002 flood showed that the new forecasting models were very accurate and significantly improved the response of the public authorities. Generally speaking, floods along the Danube take two to three days to reach their peak, so if anticipated early and precisely, this leaves enough time for everybody to prepare properly for the event.

4.2.2. Nature Protection Projects

Another large project had additional positive effects on the flooding situation in parts of the Wachau valley. The regional development authorities had been granted an EU-funded LIFE Nature project from 2003 to 2008.[17] A major part of the project dealt with reconnecting cut-off side branches of the Danube to the main river, making them part of the natural regime of the river again, mainly for ecological reasons.

During the works, a significant amount of gravel that had previously accumulated there was dug out of the side branches and relocated in the riverbed. After the 2009 flood event, the fire brigades in Dürnstein, opposite the largest reconnection project site, witnessed that the water flow measured during the flood should have resulted in a 20 cm higher water level, according to measurements recorded at former events.[18]

4.2.3. Flood Protection Systems

4.2.3.1. Luberegg (fig. 14)

The first new flood protection system that was built happened without any involvement of the regional level and without the support of the local municipality. It was privately erected by the owners of Luberegg castle, the Pichler family.

The late baroque castle of Luberegg, at the outermost fringe of the World Heritage area, had been built around 1780 by an early industrial entrepreneur,

fixed walls
walls + aluminum planks
aluminum planks

Fig. 14. Google Maps, cartography M. Schimek, 2019, Flood protection system at Luberegg

Images, Clockwise from top left:
Fig. 15. M. Schimek, 2019, Luberegg castle and the flood protection wall
Fig. 16. M. Schimek, 2019, The flood wall replaced the garden wall
Fig. 17. M. Schimek, 2019, Flood gate at Luberegg

Joseph Freiherr von Fürstenberg, as the logistical hub for his timber trading company. It was severely impacted during the 2002 flood.[19]

In 2003, Josef Pichler, owner of a number of hotels in the municipality of Emmersdorf, bought the estate and directly after that started to look for funding for protecting the castle from future floods. He was supported by the Republic of Austria and the federal state of Lower Austria. The protection infrastructure was designed in the style of most of the other public protection systems later (fig. 15), in this case replacing the garden walls of the castle by a low concrete wall on which aluminium panels can be screwed for the final height of the system (fig. 16). Only in the westernmost corner and to the side of the already existing Landhof Hotel were higher walls erected (fig. 17).

The aluminium panels are privately stored and mounted in case of emergency. The system was finished in 2006.[20] The whole infrastructure is about 500 m long.[21]

Images, Clockwise from top:
Fig. 18. Google Maps, cartography M. Schimek, 2019, Flood protection system at Hundsheim
Fig. 19. M. Schimek, 2019, Hundsheim chapel and the flood protection solution around
Fig. 20. M. Schimek, 2019, Upper corner of the flood protection at Hundsheim

4.2.3.2. Hundsheim (fig. 18)

The small village of Hundsheim belongs to the town of Mautern, opposite the town of Krems-Stein. In this case, the municipality council of Mautern started their plans to build a flood protection system without discussing it with the regional board. Thus, everybody was very surprised when they presented a draft which planned to build only fixed walls, most of them 3 to 5 m high.

The personal effort of the officer-in-charge of the Federal Monument Protection Authority (Bundesdenkmalamt) made those plans public and caused a redesign of the initial draft. In front of the historic chapel of Hundsheim, the fixed wall was replaced by the lower wall and aluminium panel version (fig. 19).

The infrastructure served as a role model for the ones coming after. It became clear however, that it was necessary for static reasons to build a fixed concrete wall at the beginning and end of the systems (fig. 20).

The construction of the flood protection system at Hundsheim started in 2006.[22] It was officially opened in February 2008.[23] The whole infrastructure cost €6.95 million[24] and is about 700 m long.[25]

4.2.3.3. Weißenkirchen, Joching, and Wösendorf (fig. 21)

The first flood protection system that was built following public discussion was also the longest so far. It protects the three villages Wösendorf, Joching, and Weißenkirchen in the municipality of Weißenkirchen.

Since there is no clear limit between the built structure of the three villages, the decision was taken not to erect three discrete polders, but one single long infrastructure. The wall was built on the Danube side of the main road, replacing the guard rails, so that the main road can be used for maintenance of the system in the event of a flood. The walls are between 80 cm and 100 cm high (fig. 22). There was some criticism of the fact that the height of the wall does not follow a certain water level but is instead kept constant despite some minor level differences along the road.

Because of this design method, the whole system only requires a single, relatively small flood gate at Wösendorf (fig. 23). At the other end, in Weißenkirchen, the street rises high enough so that the wall can simply end there.

A very good solution could be found for the enormous storage capacity that is needed for the aluminium panels. A new storage hall was erected between Wösendorf and Joching. It is not visible from the main road and is built into the wine hills, thus only a relatively small front stands out into the landscape and most of the building is hidden (fig. 24).

Images, Clockwise from top left:
Fig. 21. Google Maps, cartography M. Schimek, 2019, Flood protection system at Weißenkirchen, Joching, and Wösendorf
Fig. 22. M. Schimek, 2019, Flood wall in the relatively open land near Joching
Fig. 23. M. Schimek, 2019, The flood gate at Wösendorf
Fig. 24. M. Schimek, 2019, Aluminum panel storage hall near Joching

At the time of the planning, the Republic and the federal state made it clear that only those parts of the protection system that were absolutely needed would be publicly financed. This is why Weißenkirchen missed the chance to redesign its connection between the village and the Danube, and the area between the road and the Danube stayed more or less unchanged.

The discussions in Weißenkirchen took some years, so building was officially started in March 2008.[26] The construction site was therefore once flooded by a medium high flood in June 2009. It was opened in 2010.[27] The whole infrastructure cost about €25 million[28] (€27 million in other online sources[29]) and is 3 km long.[30]

4.2.3.4. Spitz (fig. 25)

Likewise, in the municipality of Spitz, there were lengthy discussions on the construction of a flood protection system. Once Weißenkirchen had successfully started building its system however, similar plans were also enforced in Spitz.

Initially, the system in Spitz seemed to be especially fragile, since the village lies in the outside corner of a 45° Danube bend, which means that the system has to take a higher kinetic force than other devices inside the bends of the river. In the end, the system looks very similar to the one in Weißenkirchen, though, only the flood gate on the upper end at the village part of Hinterhaus was built using a double wall of aluminium panels to be mounted over the main road (fig. 26). On the other hand, from the ferry port downwards and opposite the historic building of the Danube Navigation Company ("Agentiegebäude"), the walls were built even a little lower in order to allow ship passengers to have a good view on the building. The soccer field of the local football club was not integrated into the system but got a dam of its own towards the Danube.

On the lower end, along the mouth of the Mieslingbach creek, Spitz decided on a massive wall, since the maintenance of the aluminium panels would be rather difficult there, and the place needs to be kept safe since the storage halls for the panels are also located there. ICOMOS Austria took a particular interest in the site and architecture of the storage halls. Initially it was planned to build the halls in the hinterland, some kilometres away

from the Danube, but then the municipality managed to acquire a plot of land near the Mieslingbach, at the lower entrance to the village, and decided to relocate the storage halls without further discussion (fig. 27). ICOMOS Austria reported its disagreement with the solution but had to accept the majority decision of the advisory board. No further action was taken by the World Heritage committee.

Another particular element of the flood protection system is the mouth of the Spitzer Bach creek, the largest tributary in the inner Wachau, which had to be made safe as well. This is why in addition to the walls near the Danube, another circular wall had to be built around the creek. In this case also, a decision was taken to use the wall-aluminium panel solution (fig. 28).

Unlike Weißenkirchen, Spitz used the opportunity of the flood protection building to redesign the public space between the wall and the Danube. A number of leisure elements were integrated into the wall (fig. 29); a new service house replaced the former ship cruise ticketing shed, and the design of the waiting zones for the public buses was similar to the other new buildings along the Danube. The area around the storage halls was turned into visitor parking for people coming to Spitz – an added benefit as there was previously a severe shortage of parking spaces.

In addition, Spitz implemented a number of contemporary works of art along the Danube with the support of the Lower Austrian initiative for Arts in Public Space. Near the centre of the village, the "Spitz von Spitz" by Gottfried Bechtold, a slim golden needle, marks the peak of the 2002 flood, giving an impression of the incredible height of the water at the time. Near the storage halls, Anita Leisz built a landscape art intervention called "HWS Wiese", commenting on the typical elements of the newly designed Danube landing.[31] And all along the landing, Siegrun Appelt created a system of streetlamps specifically designed for the spot, which minimise light pollution and light the Danube landing in a reduced way, thus allowing to keep a visual connection between the river and the land also at night.

Building the system in Spitz started in 2010[32] and took two years.[33] It cost about €28 million[34] and is 1.8 km long.[35]
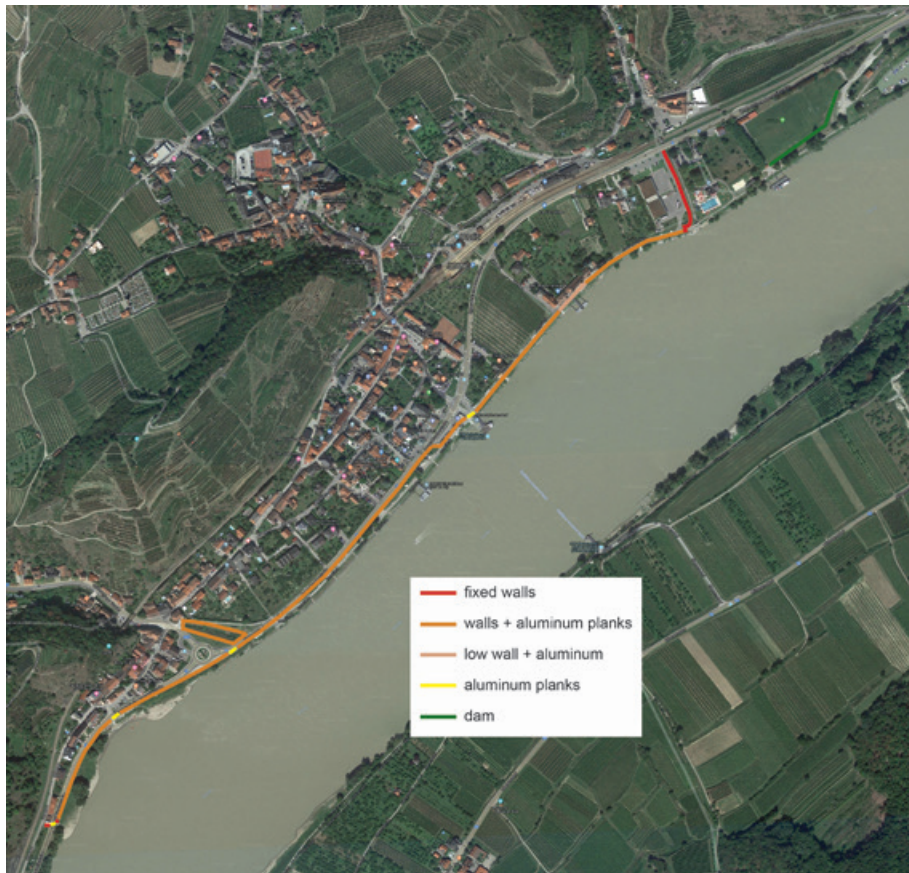
Images, Clockwise from top left:

Fig. 25. Google Maps, cartography M. Schimek, 2019, Flood protection system at Spitz

Fig. 26. M. Schimek, 2019, The double planked flood gate at Hinterhaus

Fig. 27. M. Schimek, 2019, Storage halls at Spitz

Fig. 28. M. Schimek, 2019, Flood walls surrounding the Spitzer Bach mouth

Fig. 29. M. Schimek, 2019, New design of the Spitz landing

4.2.3.5. Oberarnsdorf (fig. 30)

Oberarnsdorf is the lowest lying village in the whole Wachau, which means that it was affected by the 2002 flood the worst. Many houses were flooded up to the second floor, making them uninhabitable for quite some time.

The solution for Oberarnsdorf had to take into account building a safe flood protection system while not changing the typical townscape of the old houses lying next to the Danube to any great extent (fig. 31).

The usual wall-aluminium solution was chosen for the front of the village centre. To the side of the village, though, they are somewhat removed from the Danube and in fact quite big in places. The bonus for the village is that the area between the old houses and the Danube was widened a little, thus creating a kind of new village square which may be used for a variety of purposes, like charity fests for the local firefighters or the annual summer solstice celebrations, which is a huge traditional event in the Wachau (fig. 32).

The storage facility for the aluminium panels was located in the backyard of one of the old village houses. It was built into a steep gradient from the main road, so that the building looks modest from the street side (fig. 33). The real extent is only visible when driving down the hill – this view is obstructed from the village and the Danube, though, so it does not have any impact on the visibility of the World Heritage site.

Building the system in Oberarnsdorf started in 2011 and was finished in 2012. It cost about €9.7 million[36] and is 870 m long.[37]

Images, Clockwise from top left:
Fig. 30. Google Maps, cartography M. Schimek, 2019, Flood protection system at Oberarnsdorf
Fig. 31. M. Schimek, 2019, Center part of the Oberarnsdorf flood protection
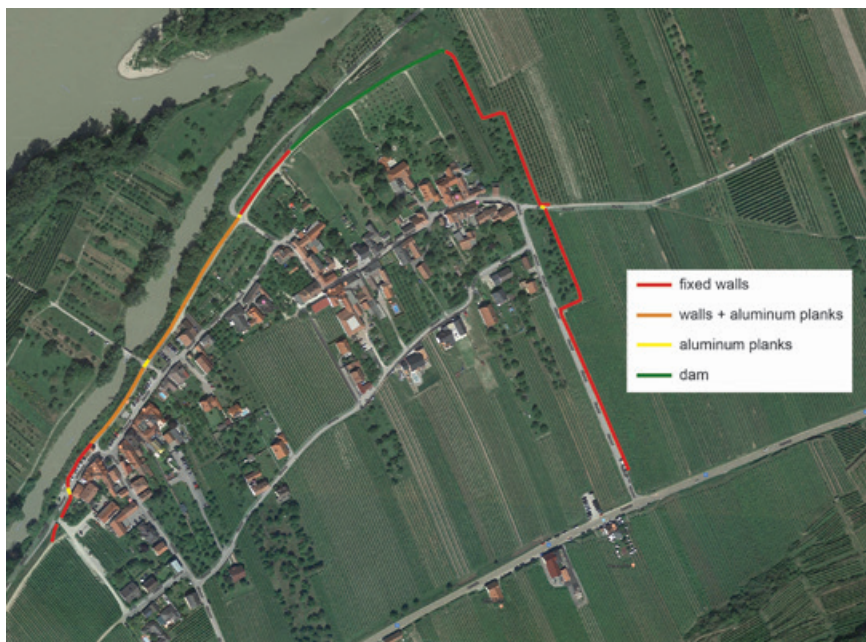**Fig. 32.** M. Schimek, 2019, Part of the new "village square" along the Danube in Oberarnsdorf
Fig. 33. M. Schimek, 2019, Storage hall seen from the main road

▶
From top to bottom:
Fig. 34. Google Maps, cartography M. Schimek, 2019, Flood protection system at Rührsdorf
Fig. 35. M. Schimek, 2019, Walls are needed deep into the vineyards because of the flat land surrounding Rührsdorf

4.2.3.6. Rührsdorf (fig. 34)

Rührsdorf, another village of the municipality of Rossatz-Arnsdorf, started to build its flood protection system at the same time as Oberarnsdorf.

The situation in Rührsdorf is significantly different to Oberarnsdorf. The village is larger and lies on a flat area to the inside of a large Danube bend. It is not directly located on the Danube, but on a side branch which was recently reconnected to the main river. This is why it floods relatively late, but when it does flood a very large area is affected.

The initial discussions centred on whether to build the whole structure as a dam or to only have very high walls. The final decision was to erect the central part of the structure using the wall-aluminium scheme. At the northern end of the structure, an existing dam was used to keep the waters away and this was supplemented by a fixed wall in the vineyards. East of the village rather high walls are needed because of the flat nature of the land surrounding the village (fig. 35).

Since the aluminium panel section at Rührsdorf is rather short, not a lot of storage space is needed. The existing firefighter station in the village was therefore adapted for storage in historicising style.

As in Oberarnsdorf, construction of the system started in 2011 and was finished in 2012. It cost €9.85 million[38] and is about 1,100 m long.[39]

4.2.3.7. Krems-Stein

Since the original flood protection system proved to be too low during the 2002 flood, the city of Krems invested in upgrading the existing schemes. The walls were left unchanged, but the aluminium panel add-ons were made taller so that there would be no need to add sand bags to the top in case of a major flood.

In addition, the Austrian Waterway Authorities agreed to dig out more gravel than planned from the Danube, since during the 2002 event they discovered that more gravel than expected had accumulated in the riverbed in front of the city. This was due to the significantly reduced flow of water at Krems-Stein because of the effects of the next hydropower dam downstream at Altenwörth. Therefore the normal water level of the Danube could be additionally reduced, providing more space for the water in case of a flood event.

4.2.3.8. Maintenance of the flood protection infrastructures

A big issue for the functionality of the flood protection systems is maintenance. In order to work properly, the aluminium panels are filled with Danube water after mounting. When the flood recedes, sand and mud stay in the panels. They must be cleaned as quickly as possible after a flood event, to remove the mud before it dries. Two teenage students from the Technical Secondary School in Hollabrunn – one from

Weißenkirchen – developed a machine which allows the fire brigade to clean the panels in an automatised way, using only a fraction of the time and resources, such as water, usually necessary.[40] The device is still used and frequently tested by the fire brigade and the Austrian army in joint practice sessions (fig. 36).[41]

4.3. The Giant Flood of 2013

Only 11 years after the catastrophe of 2002, another similar huge flood event hit the Wachau between 3 and 9 June 2013.

The unusually high amount of precipitation in the Austrian and Bavarian Alps was the cause of the flood. In the Wachau itself, almost no rainfall was recorded this time. The precipitation initially fell as snow in the higher Alpine regions. Shortly after, temperatures rose again, making the snow melt. In 2013, the flood waves of the Bavarian Danube and the Inn cumulated, as in 1954. The water peak was aggravated by the influx from the Traun and Enns river.[42]

Because of the "modified release" of the precipitation that first fell as snow, the whole flood event lasted for six days this time, similar to the flood of 1954 (fig. 37). The maximum amount of water passing through the Wachau was calculated at 11,450 m³/s, which was even slightly more than in 2002. Nevertheless, the maximum

◄

Fig. 36. M. Schimek, 2019, Aluminum plank washing machine at work during a practice with the Austrian army in Weißenkirchen

▶ **Fig. 37.** The June 2013 flood on the Danube, in: Godina *et al.* 2014, 32
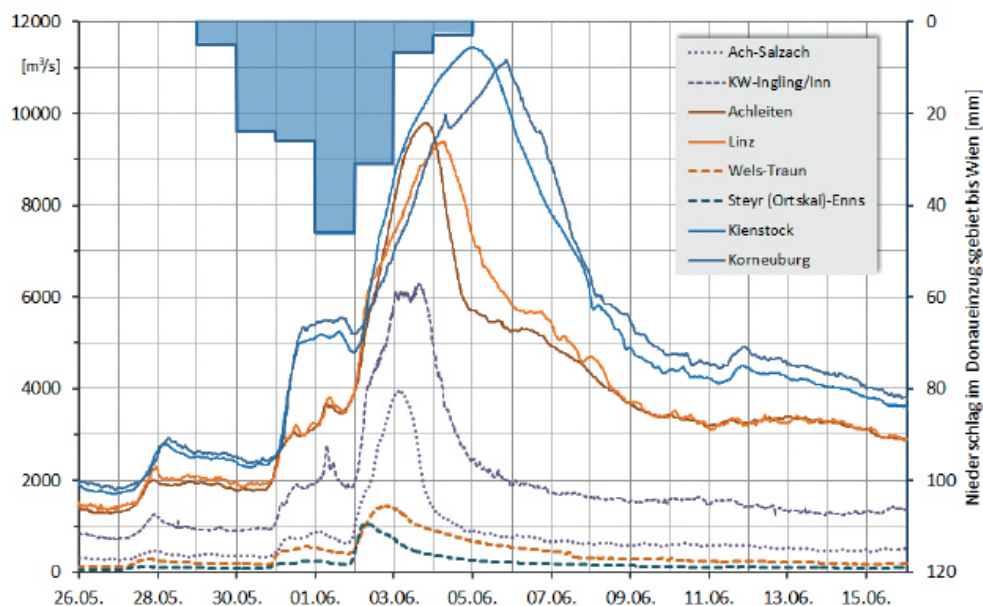
peak of the flood was recorded at 10.81 m at the measuring station in Kienstock, which was 12 cm less than in 2002.[43]

Of course, all the villages not so far protected were flooded again as in 2002. Where a flood protection system already had been built, however, the devices fully functioned and kept the water and the mud out of the inhabited areas. Furthermore, the new forecasting models and disaster response plans proved to be extremely well done and helped relieve the impact on those affected significantly. Since there was no catastrophic event in the hinterland this time, all the fire brigades from around were available to assist the local blue light organisations and the army in handling the event.

4.4. Actions from Around 2013 to 2019

4.4.1. Additional Financial Means for the Remaining Projects

Since the already existing flood protection systems proved ultimately successful during the 2013 flood, the public authorities agreed that implementing the remaining flood protection projects needed to be done with a higher priority than originally planned. This is why the Republic of Austria and the federal states signed the "15a agreement" ruling on efforts to be financed by the republic and the federal states jointly according to Article 15a of the Austrian Constitution.

As before, the Republic of Austria would contribute 50 per cent of the necessary finances to the scheme; 30 per cent would come from the federal states and 20 per cent from the municipalities. It is possible however that there might be a problem with this; the Republic of Austria basically guaranteed 50 per cent of the costs, but also explicitly capped the maximum expenses at 50 per cent of the total costs reported by the federal states in 2013, with no way of extending its share. So where projects prove to be more expensive than projected, the difference has to be covered by the federal states and the municipalities without the support of the republic, which was of course not really good news for the municipalities and the federal state but a rule which, at least at the moment, is not discussed.[44]

4.4.2. Implemented Additional Flood Protection Projects

4.4.2.1. Melk

Melk, the second largest city of the Wachau region, world famous for its magnificent baroque monastery, had already started building their flood protection in February 2013,[45] making use of the financial rules from 2002 to 2013 (additional 7.5 per cent of the costs taken over by the federal state of Lower Austria). Unfortunately, the 2013 flood came too early in this case, as the city was still unprotected, and the construction site was badly damaged by the event.

The flood protection itself is 540 m long and all constructed in the wall-aluminium version.[46] It cost €10.1 million.[47] The aluminium panels are stored in the new fire brigade house which was built some kilometres from the city at the motorway exit, outside the World Heritage area.

One particular issue with the flood protection in Melk is that the Weierbach creek runs straight through the city in a tube. This tube, partly located under century-old houses, had to be renewed. Therefore, the construction site was not only right at the Danube, but also quite far inside the historic city centre, so a lot of care had to be taken not to damage the historic substance. The City of Melk took the opportunity to invest another €4.1 million[48] into redesigning the Danube landing and into a total reconstruction of the Hauptplatz (Main Square) and the Kremser Straße and Linzer Straße, which had to be totally dug up because of the Weierbach creek issue.

Cables and canal were renewed underground, car traffic and parking were reduced, asphalted street surfaces were replaced by cobblestone, and the main square was turned into a "meeting point"[49] which can be used in multiple ways for events, presentations and cultural purposes (fig. 38). A special feature implemented is the so-called "World Heritage Lens", a platform partly built above the water providing visitors to the city with an improved viewpoint to the front of the baroque abbey (fig. 39). The lens was additionally funded from the World Heritage budget of the republic in order to ensure that the protection system is more aligned with the World Heritage status of the city.[50]

The flood of 2013 caused damage amounting to €5.5 million.[51] So, technically speaking the new protection system will have paid for itself after two to three more floods in the future. The finishing of the project was celebrated with a weekend-long festival in September 2014.[52]

4.4.2.2. Oberloiben, Unterloiben, and Dürnstein

Both Oberloiben and Unterloiben have a similar location to Rührsdorf – rather high up, but on flat land, where the water may reach far into the land. This is why for both villages some longer side walls had to be planned.

The flood protection in Oberloiben was built in the usual style – walls plus aluminium panels on the outside of the main road towards the Danube, flood gates at either end, plus a third flood gate on a crossing leading down to the river. The upper flood gate is constructed like the one in Spitz so that two panels walls can be inserted into the gate. All the walls were built in the same style as in Spitz and Weißenkirchen.

The protection schemes in Unterloiben differ quite a lot from most of the other ones so far erected. In Unterloiben, the decision was taken to integrate the walls into existing garden and vineyard walls, on the inner side of the main road, seen from the village. This is why the main road remains flooded in case of an event and cannot be used for maintenance of the system in an emergency. Downstream from the parish church, houses of private landowners are located

From left to right:
Fig. 38. M. Schimek, 2019, Design elements along the main square in Melk
Fig. 39. M. Schimek, 2019, The "World Heritage Lens" enhances the visibility of the baroque abbey from the Danube landing

▶
From top to bottom:
Fig. 40. M. Schimek, 2019, Emergency lane at Unterloiben
Fig. 41. M. Schimek, 2019, Massive walls at the upstream part of the flood protection in Unterloiben

further away from the Danube. This is why they agreed on an emergency lane to be built inside the walls on their land (fig. 40), which allowed the municipality to follow the usual concept of walls and aluminium panels, though on higher base walls than usual, since the wall was integrated into an existing vineyard wall at the lower end of the village.

Upstream from the parish church, there was less space between the road and the houses, so here the whole protection was built as a very tall wall, which led to a lot of public discussion. People had forgotten, though, that there had been a similar wall here previously, but because it was overgrown with ivy it had not been perceived as a tall wall. The new wall was in fact, only about a metre higher than the previous one, which was clearly marked out by the new design (fig. 41). It was agreed that the new wall would also be covered with vegetation. However, the new bushes were planted in the extremely hot summer of 2015, and not all of them survived, so it will probably take a bit more time before the wall looks as it did before 2013.

Since the base walls downstream from the parish church were meant to look like the vineyard walls they were integrated into, most of these walls were, as in Krems-Stein, covered with brick stones.

A positive effect of the tall wall solution is that the storage facility for the aluminium panels could be kept very modest. It was built inside the village of Unterloiben, next to the kindergarten, and does not detract from the townscape of the village. Another reason for reducing the number of aluminium panels is that Dürnstein, unlike the other municipalities on the left bank of the Danube, has no road into its hinterland, which makes it difficult for fire brigades from the hinterland to support the local people in building the scheme, so maintenance of the system has to be undertaken by the currently less than 850 inhabitants of the municipality themselves.

Building in Oberloiben and Unterloiben started in 2014, the protection system was finished in 2015. The projected costs amounted to €14.75 million. The whole system is 1.7 km long.[53]

An additional short protection wall for some of the houses upstream from the old town of Dürnstein was erected in 2016. This wall was also covered with brick stones, like the walls in the downstream part of Unterloiben.

4.4.2.3. Emmersdorf

The flood protection in the municipality of Emmersdorf, opposite Melk, should have been built later, since the village lies about a metre higher than the affected parts of Spitz and Weißenkirchen. In 2013, however, the whole historic village centre of Emmersdorf was severely flooded, necessitating the speeding up of plans.

So far, the protection for the villages of Emmersdorf and the small settlement of Seegarten have been finished. In Emmersdorf, the scheme is 650 m long.[54] Except for a short part at the camping site, which is built as a tall wall, all other parts were constructed in the wall-aluminium style, with flood gates on both ends. The storage halls were built next to the camping site. A public toilet and an ATM desk were also integrated into the building. Since the walls in Emmersdorf were built on the outer side of the main road from the village, it was not possible to plant bushes, due to the steep gradient towards the Danube and the fact that the so-called Treppelweg, the maintenance road for the waterways authorities, is located between the Danube and the flood protection walls (fig. 42).

The protection system for the settlement of Seegarten is 460 m long.[55] The storage hall for the aluminium panels was built into an existing dam close to the alluvial forest.

In some corners, tall walls were chosen, the rest of the structure is the usual wall-aluminium design, in order to keep a connection to the river and one of the best viewpoints on the Abbey of Melk from the other side of the Danube.

At Seegarten, the opportunity of building the flood protection system was used to create a proper turnaround for the public buses that go from Emmersdorf to Seegarten before returning to Emmersdorf and then on to Melk. Previously, the buses had to reverse on the main road. A particular feature of the flood protection in Emmersdorf are the specially designed waiting zones for the public buses, which were integrated into the design of the flood protection (fig. 43).

Both parts of the flood protection in Emmersdorf were started at the end of 2015 and took about three years. They cost €16.7 million.[56]

4.4.3. Not yet Finished Protection Projects

4.4.3.1. Schönbühel-Aggsbach

The largest flood protection system in a single municipality has just been started. The infrastructure in the municipality of Schönbühel-Aggsbach will consist of five single polders, at Schönbühel, Aggsbach Dorf, at the historic Aggsteinerhof and the two separate parts of the village of Aggstein. In total, these protection elements will cost almost €45 million, financed by the new treaty between the republic and the federal states.[57]
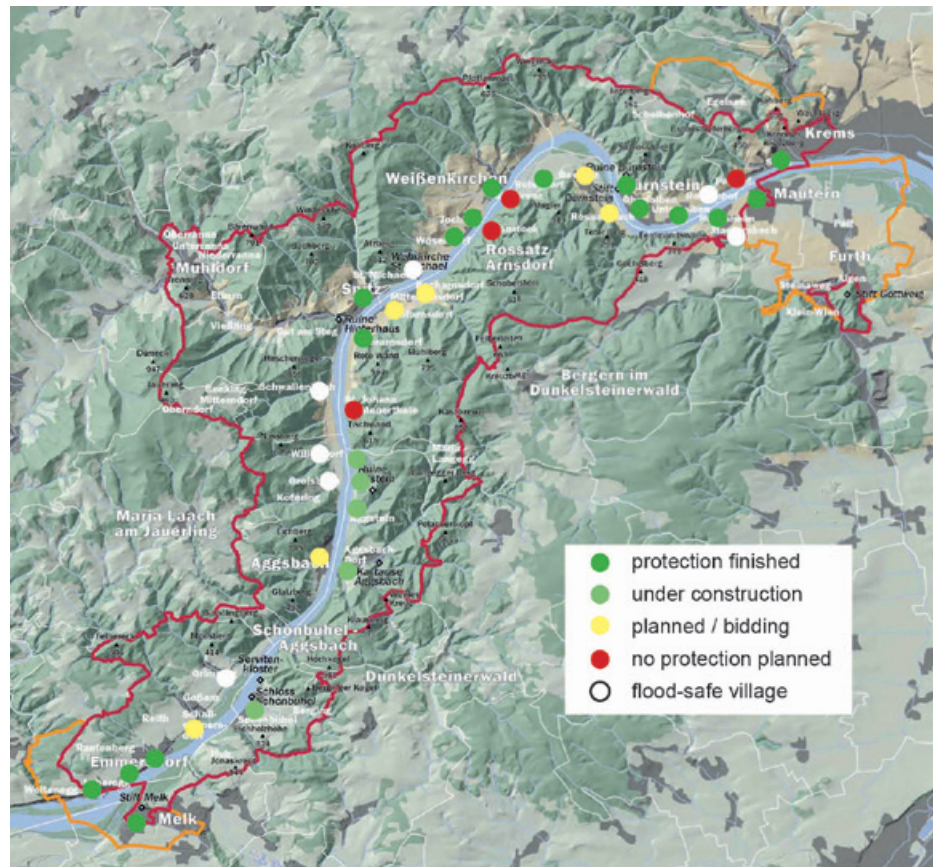

From left to right:
Fig. 42. M. Schimek, 2019, Location of the flood protection walls in Emmersdorf directly at the Danube
Fig. 43. M. Schimek, 2019, Newly designed bus waiting zone at Seegarten

► **Fig. 44.** The World Heritage region Wachau, in: Zech *et al.* 2017, 24-25, cartography M. Schimek, 2019, Overview over all flood protection projects

Currently, the two polders around Schönbühel and Aggsbach Dorf are under construction. The walls in Schönbühel will run along the village from its upstream end until the rock on which Schönbühel castle is situated using the wall-aluminium panel design and be similar in look to the schemes at Spitz and Weißenkirchen. The storage halls are being built off the main road.

Aggsbach Dorf needs a shorter wall along the Danube. On the other hand, the walls have to follow the Aggsbach creek almost a kilometre inland, since the area there is rather flat. The municipality will use the opportunity to erect a new village centre building, including storage facilities for the panels, a new municipality office and public housing, near the creek.

The other remaining polders have not yet been started, except for the storage hall, which is needed because all necessary panels were bought at the same time, reducing the price per item.[58] The storage hall is built into the mountain opposite the Aggsteinerhof, some metres away from the main road.

4.4.3.2. Remaining projects (fig. 44)

In the municipality of Rossatz-Arnsdorf, the next construction site, at the village of Rossatzbach, is scheduled for 2020 if the bidding process yields acceptable results.[59] The projects at Bacharnsdorf, Mitterarnsdorf, and Hofarnsdorf, and at Rossatz have all been launched with planning and bidding. The two tiny villages of St. Johann im Mauerthale and St. Lorenz, both with historically very interesting churches, will remain unprotected, though.[60]

In Emmersdorf, the village of Schallemmersdorf is still not protected. During the bidding phase some problems with higher costs than expected arose; but they should be cleared soon.[61]

The last municipality which might start building is the small municipality of Aggsbach Markt, opposite Aggsbach Dorf. The bidding procedure there did not yield the expected number of valid bids, and those which were submitted were far beyond the calculated costs. In case of implementation, the village of Aggsbach Markt will be protected by a wall similar to the one in Schönbühel.[62]

5. The Outcomes and Effects

In the end, all the flood protection systems in the World Heritage region Wachau that were built after the flood of 2002 were planned and implemented following common rules that were discussed on a regional level. Some exceptions are justifiable, looking at the various local circumstances and environments which vary from village to village.

All flood protection systems that were already finished by 2013 fully functioned during the huge flood of June 2013. This experience stopped almost all discussions about the feasibility of the infrastructures and forced the public authorities to speed up implementation of the remaining flood protection schemes.

The involvement of a wide range of local stakeholders, including ICOMOS Austria and skilled architects, assured that all flood protection schemes were, in as far as possible, built with a lot of respect for the World Heritage landscape. Decisions were taken at a local level and based on widespread agreement. All projects so far have been implemented without becoming subject of a State of Conservation Report or causing the official involvement of UNESCO. The fact that a number of historic buildings are now safe from being flooded frequently – something which would, taking into account the ongoing discussion about the effects of climate change, be rather likely – strengthens the World Heritage status of the cultural landscape and is a major relief to the private house owners in the region. This effect definitely creates more of an asset to the World Heritage than the loss of significance the unavoidable slight alteration of the landscape caused.

Even though many villages are protected now, there will never be 100 per cent security. This is why disaster management plans still include the necessity of evacuating people. If a similar situation to what occurred in 2002 were to happen, it is still unclear if the support of other fire brigades from the hinterland, as laid down in the disaster management plans, would really be available. Trainings on mounting the aluminium panels to the walls and checking the functionality of the disaster management plan are carried out every year, in order to ensure those involved (most of them volunteers) are fully aware of what to do in the face of a possible future disaster. Furthermore, the newly acquired high level of security helps landowners to obtain insurance for their property, something which was without the flood protection systems. The flood of 2013 showed that the costs of building and maintaining the flood protection systems will be amortised over the prevention of two to three floods at the most.

So far, the follow-up costs of maintaining the flood protection infrastructures are moderate and amount to around €10,000 to 20,000 a year per municipality.[63] Of course, after a certain period the municipalities will have to face additional costs for the replacement of elements of the infrastructures, like pumps or aluminium panels, but so far the follow-up costs are far below the initially (2004) anticipated 1 per cent of the building costs. The municipalities are, in addition, financially supported by the federal state of Lower Austria in covering these costs.

Of course, the building of the flood protection systems means a certain alteration of the traditional protected landscape of the World Heritage region Wachau. The older examples, for example in Luberegg or Weißenkirchen, show however, that aging and the growth of vegetation will help to relieve the visual impact of the infrastructures on the landscape. It is still the traditional townscapes and the magnificent views on the cultural landscape that are in the foreground for people passing through the valley.

6. Additional Comments

Uncredited details of the events from 2002 until today come from the personal experience of the author, who served as the World Heritage site manager from May 2002 to September 2018 and therefore witnessed all developments described personally.

7. Details of the Expert Completing the Case Study

Michael Schimek, Dipl.-Ing. MA was born in Vienna, Austria in 1972. He studied Spatial Planning at the Technical University of Vienna, Austria, from 1992 to 1998. He then studied Landscape Architecture, at the Swedish Agricultural University at Alnarp, Sweden from 1996 to 1998. He studied Music Management, at Danube University Krems, Austria from 2014 to 2017.

He gained professional experience as a planner for municipalities (local development plans, zoning plans, expertise on townscape and landscape issues) from 1998 to 2002. From May 2002 to September 2018, he was manager of the regional development agencies for the World Heritage cultural landscape Wachau, Austria, and was thus in charge of World Heritage site management. He is editor-in-charge for the current site management plan.

Since 2018 he has been a freelance consultant in regional development, with a focus on cultural management and World Heritage issues.

Notes

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3. comp. Strasser 2017, 9; flood marks on house Oberarnsdorf 16, own photgraphy.
4. https://de.wikipedia.org/wiki/%C3%96sterreichische_Donaukraftwerke
5. Strasser 2017, 25.
6. https://www.steb-koeln.de/hochwasser-und-ueberflutungsschutz/hochwasser/Hochwassergeschichte/ Hochwassergeschichte.jsp
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8. http://www.noe.gv.at/wasserstand/#/de/Messstellen/Details/207357/ DurchflussPrognose/48Stunden
9. Godina *et al*. 2004, 15.
10. Godina *et al*. 2004, 34.
11. http://www.noe.gv.at/wasserstand/#/de/Messstellen/Details/207357/ DurchflussPrognose/48Stunden.
12. Godina *et al*. 2004, 33.
13. http://krems.vpnoe.at/startseite/news-detail/article/hochwasserschutz-in-spitz-an-der-donau.html
14. For the functionality of those systems comp. the following YouTube video: https://www.youtube.com/ watch?v=VhIV9ivrJ9w [accessed 28 Sep. 2019].
15. https://www.ris.bka.gv.at/Dokumente/Bundesnormen/NOR11005084/ NOR11005084.pdf
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29. https://austria-forum.org/af/AustriaWiki/Wei%C3%9Fenkirchen_in_der_Wachau
30. Measured in Google Maps.
31. Traditionally, along the Austrian Danube, ships didn't land in a harbour area, but all along the riverbank. This is why the roads along the riverbank in Austrian German are called "Lände". There isn't a really proper English translation for this word, so "landing" was used (since it also has the same meaning and similar language roots).
32. https://porr.at/projekte/hochwasserschutz-spitz-an-der-donau/
33. https://www.bmvit.gv.at/verkehr/schifffahrt/hochwasserschutz/15aBVG.html
34. personal information by Norbert Notz, manager of the municipality office of Spitz, 22 Aug. 2019.
35. Measured in Google Maps.
36. https://www.hydro-ing.at/hws-oberarnsdorf.html
37. Measured in Google Maps.
38. https://www.hydro-ing.at/hws-ruehrsdorf.html
39. Measured in Google Maps.
40. https://www.jugendinnovativ.at/projekt-teams/projekte/projekt/projekt/dammbalkenreinigungsanlage-fuer-den-hochwasserschutz-weissenkirchen/

41 https://www.noen.at/krems/rekruten-trainierten-mobilen-hochwasserschutzaufbau-in-noe-4354649

42 Godina *et al*. 2014, 31–32.

43 Godina *et al*. 2014, 32.

44 https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen& Gesetzesnummer=20008613

45 http://www.melk.gv.at/de/Spatenstich_Hochwasserschutz_Melk

46 NÖN 2014, 2.

47 NÖN 2014, 4.

48 NÖN 2014, 4.

49 NÖN 2014, 8.

50 NÖN 2014, 10.

51 NÖN 2014, 3.

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RECONSTRUCTION OF THE SYMBOLIC AND PHYSICAL SPACE OF THE TEMPLE OF NUESTRA SEÑORA DE LA ASUNCIÓN OF SANTA MARÍA ACAPULCO, SAN LUIS POTOSÍ, MÉXICO

Renata Schneider
INAH

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1. The Heritage Resource and its Context Before the 2007 Disaster

1.1 Description Designation and Recognition

On 1 July 2007, lightning struck the palm roof of the church of Nuestra Señora de la Asunción in Santa María Acapulco, Santa Catarina, San Luis Potosí, México. The church was founded by Franciscan friars, in approximately 1750 (fig. 1). This was not the first time this had happened: the building had experienced a similar lightning strike at the beginning of the twentieth-century, which had destroyed the niches and central sculptures on the church's façade. On this occasion, within five hours all immovable cultural heritage contained in the building was irretrievably lost: the roof burnt within a few minutes and collapsed soon after. The inside of the temple was completely burnt, and altarpieces, the pulpit, benches, beams and the coffered ceiling were destroyed.

The National Institute of Anthropology and History (INAH)[1], through the INAH Center in San Luis Potosí and the National Cultural Heritage Conservation Coordination (CNCPC) which had been working together for several months in Santa María Acapulco since 2006, accompanied the village's inhabitants in their mourning, while also initiating the necessary procedure to collect disaster insurance compensation managed at the federal level, which insures most of the country's historical monuments. Likewise, it programmed a series of interventions to be carried out within eight years encompassing total rehabilitation, conservation and restoration of the temple.

This case study describes these interventions and how they were implemented with the community, respecting its own decision systems. But mostly, it describes how the rehabilitation of the building later enabled the continuity of the village's religious, civil and daily life, generating additional questions about customs, activities and group decisions of the Pame of Santa María Acapulco (fig. 2).

The church in question is a unique building in México, founded by the Franciscan order in the middle of the eighteenth-century as a visiting (or secondary) church of the region of the Sierra Gorda mountain range in México. The building is constructed of soil and stone, plastered with lime and clay, and covered with a palm roof placed asymmetrically over the geometry of the property. The temple shares the space with the parish building made with the same materials, within a large atrium demarcated by a simple superimposed stone wall. This complex occupies the centre of the Santa María Acapulco village and is visible from a great distance within the mountain range. Inside it was elaborately decorated in a baroque style evident mainly in its four wooden altarpieces, decorated with various sculptures and canvases, and covered in silver leaf, as well as a wooden coffer plastered and decorated with rich iconography.
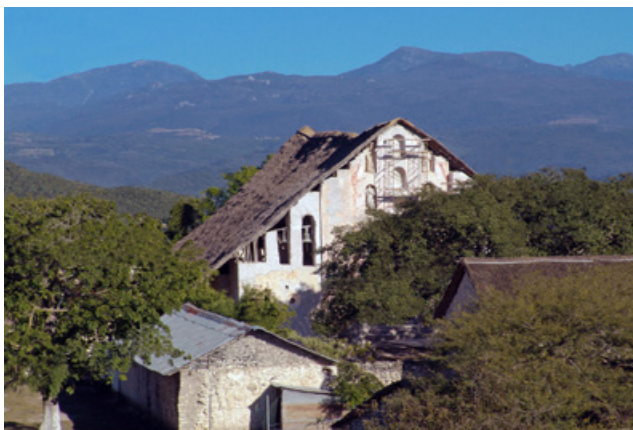
From left to right:
Fig. 1. The religious complex. (Image by Renata Schneider)
Fig. 2. The interior of the temple in 2006. (Image by Renata Schneider)

From left to right:
Fig. 3. Localisation of Santa María Acapulco within Mexico
Fig. 4. Pame women during 2008 Holy week. (Image by Renata Schneider)

Santa María Acapulco is a community founded circa 1665 in the Sierra Gorda mountain range in central México (fig. 3). Its inhabitants are indigenous Pame (Xi'ói) who were extremely isolated from the rest of the country until recently. The village temple is the seat of the civil and religious authorities of the ethnic group in the central area of the group's habitat. Thus, of the almost 17,000 Pame who currently live in México (INEGI 2015), about half are dependent on this settlement.

The village, as such, houses around 800 people. The rest of the 7,000 inhabitants live in more than twenty-two communities that make up, together with the county town, the urban centres of the ejido of Santa María Acapulco, an important part of the municipality of Santa Catarina. The county town did not have electricity until 1999 and its first paved road was only built in 2006. The settlement configuration follows a dispersed pattern, product of a farming tradition of hundreds of years.

The high poverty rate that characterises the municipality of Santa Catarina (which occupies the fortieth most marginalised position of the 2,454 municipalities throughout the country and the first one in San Luis Potosí), makes it almost impossible for each community to have the most basic services. Housing and education conditions are incredibly precarious: according to the

2010 National Population and Housing Count, 20.86 per cent of its inhabitants live without electricity and 57.32 per cent without access to piped water; 85.35 per cent live with less than two minimum wages a day, and 49 out of every 1,000 children die during childbirth or shortly after. According to the National Institute of Indigenous Peoples' Atlas (2019), almost 3,000 people are illiterate.

The community has a government system parallel to that of municipal authorities: they are basically governed by a "traditional governor", a judge, a prosecutor (or fiscal) and a sacristán, and each one has two substitutes, in addition to an indigenous trustee in the municipality, and a number of ejido authorities elected each year. The governor, the fiscal and the sacristán are responsible for organising all religious celebrations and for taking care of the temple, as well as covering the cost of every activity that takes place in it. They are assisted by a council of elders, "the principals" (principales), whose members, in general, have been governors before. The governor and judge see to matters related to the ejido's daily life, community tasks and delivery of justice. The ejido delegate is the authority on land matters and farming credit applications. As for the parish priest, he visits sporadically, every two or three months. During his stay, marriages and collective baptisms are held, and sometimes there are masses to celebrate weddings or individual baptisms (fig. 4).

This type of community organisation was established in México during the nineteenth-century and not during colonial times, as is generally believed (Chance and Taylor 1985): it is a complex system that involves and weaves the village in an intersubjective manner, as young people are designated to fulfil obligations in minor positions (policemen, messengers, etc.), climbing up the ladder through the years until they reach higher positions and eventually become principals. The traditional government of Santa María is parallel to the national one and is recognised by the laws of the country. It is structured around what is known in the sphere of Mexican anthropology as a "cargo (position) system" and it is very common in almost all indigenous communities of the country and Central America (with regional and local differences that make it impossible to say that one village is organised similarly to another, or that it has the same number of positions as others). Usually, although increasingly less so, because it involves an investment in time and resources with no remuneration, it is considered an honour to "serve" in the community. In Santa María, cargos change annually and all of them are reassigned, except for the role of prosecutor and sacristán who do not have a pre-defined period of time to fulfil or leave their position.

On the contrary, the organisation during colonial times was neither internal nor democratic:

<<...in the colonial period, the religious missions, also called 'reductions', had the expectation of serving as a means of acculturation or westernization of the indigenous groups. Following a model that had been imposed in Europe since the foundation of Catholicism itself, it was hoped that through the knowledge and adoption of the faith, the incorporation of the neophytes or new converts into the social order imposed by military force would be easier [...] The colonial order imposed by the Spanish crown assumed that the indigenous people had to be 'reduced,' not necessarily in number, but in terms of the space where they lived: by forcing them to develop their communities around mission chapels, a more effective control over their productive and social activities was exercised and thus resulting in a successful internal control of colonized individuals (Cummins and Rappaport 1998). In the case of the Pame, the

mere idea of creating a definitive settlement was radically against their cultural practices, characterised by nomadism and by living mainly by hunting and gathering>> (Granados 2015: 8).

That is, a mission was a village. It was comprised of a temple and buildings around it, which were occupied by the friars and some Spanish settlers. Indigenous people lived in the vicinity in their family cornfields or milpas. With the secularisation experienced in México in the nineteenth-century and, above all, because of the weakness and lack of a strong administrative system in the new country, cargos were opened to cover those absences. In the case of Santa María, as in many villages in the north of the country, the people chosen by the community to occupy the traditional positions subsequently went on to live in the urban centre, somehow occupying the place of the friars and the representatives of the Crown, returning to the family milpas at the end of their term of office and transferring the position to a substitute. In the twentieth-century, compulsory education led them to gather and form denser villages, although the organisational and management system continued to be this rotating and dispersed system (Chemin 1985).

Materially speaking, the small village/mission of Santa María Acapulco was comprised, until recently, of a few houses built from reed structures that were filled with limestone and then covered with mud, and subsequently roofed with palm branches (Félix Rubio and Teodoro García, personal communication 2006).

1.2 History and Context

The first church of Santa María Acapulco must have been a simple construction of perishable material, serving as a visiting temple of the network of churches in the custody of San Salvador de Tampico, but by 1753 there is already evidence on the status of Santa María Acapulco as an independent mission (Granados 2015). It is likely that the remains of mural painting that we found on the gable wall of the current building after the 2007 fire were part of this first moment of importance of the mission,[2] when the dispersed settlement was concentrated in a smaller territory than the one the Xi'ói originally had in the early years of the Colony and, of

course, before it. The building was already what we see today: a large temple, a single nave, built of limestone ashlars grouted with mud and plastered with a poor mixture of lime, clay and sand. It was probably covered with a thatched roof, as it is today (figg. 1 and 17A).

In those same years, Santa María Acapulco was a relevant settlement close to the commercial road that connected the Sierra Gorda mountain range with Tampico. This route was useful as a way to colonise the Gulf of México coast. The abuses committed against the Pame people during this colonisation campaign were terrible. For example, they were transferred on foot, walking in a row tied by the neck (Gallardo Arias 2011: 110–111; Granados 2015).

Therefore, because of the reasons mentioned above, (constant poverty, invasions and land reductions, poor living conditions, abuses committed by the white population and forced migrations), it is surprising to see the degree of decorative material wealth contained inside the mission of Santa María Acapulco. Unfortunately, there are no colonial references or sources regarding the church and its elaboration process.

The platform where the religious ensemble of Nuestra Señora de la Asunción is located was placed and artificially levelled resulting in the large atrium (currently subdivided by sharing its space with the primary school since the 1970s), which houses the parish building and the temple with its annexes. Atypically, the parish building was not part of these premises. It is located on the other side of the atrium and is a two-room building, made of limestone and mud covered with a scissors truss structure made of reed and palm elements. An atrial cross and a large tree indicate the midpoint between the church and this building (Garay 2014).

The church has a rectangular plan with a western orientation. It measures 22.70 x 7.40 metres. The nave is rectangular, without crossings. The presbytery is defined from a high podium, which is accessed only by members of the traditional government. A single window illuminates the nave on the south side (Garay 2014; Corvera 1999).

A simple wooden choir covers the sotocoro of the main entrance. The sacristy and the pre-sacristy are placed laterally on the north side and are protected by a porch of wooden masts that generate a protective covering on that façade. The walls are made of sedimentary stone from the region, 1.00 meter thick. This entire structure is covered with a scissors truss structure made of wood and palm. The entire nave, inside, is covered and protected with a "coffer" or a false wooden vaulted ceiling. Above this, the gabled structure made of regional wood extended towards the annex, supporting the upper structure made of palm branches. This cover is asymmetrical when descending along the north side to the annexes, lower than the nave, a unique feature that is not repeated in other example of religious architecture in the region. The floor of the nave and annexes are made of rammed earth. It has never had a clay or stone tile floor (Garay 2014: 6).

Until now it has been believed that the church's façade (made of lime and sand and decorated with lime, gypsum plaster and adobe core sculptures) copies the iconographic pattern of the façade of the relatively nearby church of Santa María de las Aguas de Landa, much greater in importance and of Immaculist style (Granados 2015).

The inside had four altarpieces and a choir with a canopy covered with silver leaf and some gold leaf details, several oil paintings and many carvings; as well as mural paintings representing saints and martyrs and some scattered scenes. The wooden coffer had a very rich tempera iconography painted over a plaster layer, calcium carbonate and glue.

The inside of the temple could be part of a donation of altarpieces that were replaced by neoclassical altarpieces in a settlement with more money (Granados 2015). Despite this, the beautiful wooden coffer was specifically made for the temple with a very rich iconographic and even doctrinal discourse. Unfortunately, beyond a few research works conducted by Heidi Chemín (1984), Dominique Chemin (1996), Corvera (1999), Patricia Gallardo (2011) and Rosario Granados (2015), practically nothing is known about the history of the settlement, and, much less, about the construction and subsequent renovations of the church.

Unfortunately, these authors, despite having consulted several (and scattered) sources from the eighteenth and nineteenth centuries, have not been able to find the work contract for the renovation of the temple and, due to the remoteness and isolated location of the settlement, they have not found documents to develop chronologies or extensive stories about the building or the settlement either. They have therefore focused more on the rebellions that Pames took part in, data on the Pame culture in general, or much more recent anthropological studies.

Afterwards, over the years, the church was filled with pieces from other places; for example, during the period of the Mexican Revolution (1910–1917) the saints of the chapel of a landowner in the region were transferred to Santa María, given its geographical isolation, as a measure of protection. Also, many contemporary pieces of plaster pastes or plastic have been added to the temple's initial collection.

It is important to point out that the construction of the church does not correspond to the vernacular building techniques in the area: although it was made with materials from the region, it was not conceived by the local population, but by the friars and the Spanish settlers. The palm cover and its structure do correspond to the constructive local tradition.[3]

The state of conservation of the temple and of these movable elements previously described was – upon our arrival in 2006, as a team of CNCPC-INAH restoration specialists – in very bad condition: several parts of the decorated coffer were detached or already fallen; the sculptures were very dirty and in some cases without upper or lower extremities, or even without eyes (which did not prevent them from being taken out in processions and fulfilling their functions as sacred pieces). The altarpieces had evidence of bark beetle attacks and several structural failures.

Both the façade and some movable property had already been subject to previous interventions in the early 1990s. Conservator Cecilia Carreras was responsible for working on some paintings, many of them irretrievably lost during the fire. Thanks to her help we were able to count on several essential photographs to reproduce canvases

and panel paintings after the fire. Carreras was hired by the Ministry of Human Settlements and Public Works (SAHOP), an agency that carried out work on the façade.

The façade underwent an intervention of very poor quality and appearance, carried out with a poor mixture of lime-sand and a vinyl-based polymer: it urgently required work to eliminate the remains of previous interventions, consolidation, replacement of plastering and chromatic restitution. It is worth mentioning that we were never able to locate a single file that gave an account of the work done on the façade, not even the company's name or the contract conditions.

The palm cover could not prevent serious leaks into the coffer. In 2005, the state government of San Luis Potosí intervened and repaired some damaged parts of the building and restored six paintings from two of the altarpieces.[4]

Despite this, or perhaps because of this, the feeling inside the temple was virtually that of a sacred space of the end of the eighteenth or beginning of the nineteenth-century, especially because very few of its parts had been touched or altered since the end of the eighteenth-century.

That year, in order to respect that "aura" and waiting to make a decision about whether or not to do works on the temple, and how to do so, professional photo documentation was carried out in every corner of the church, and the conservation process of the façade and two polychrome sculptures began. Four external professional conservators from INAH and ten locals were included as assistants and coordinated by the author of this text.

In addition, two workshops were conducted concurrently: one to create an inventory of movable and immovable property by destination,[5] and another one to introduce the notion of local heritage. The first workshop was extremely difficult to carry out due to the low literacy rate of the Xi'óis in Spanish (and also in Pame, which is almost non-existent in printed texts).[6] each inventory card took us between half a morning and a day to complete. In this case, plastic modern or contemporary pieces and instruments of local power were also

registered, given that for the community they are as valuable – sacred – as the objects from colonial times. This work was invaluable: later it was used for the piece by piece insurance collection.

The heritage approach workshop was very challenging. The Xi'ói authorities and interested people who attended out of curiosity, did not actively participate in any of the exercises proposed, and very technical words such as "heritage", "valuation" and "culture", among others, which in mestizo communities worked very well, meant absolutely nothing to them: for the Pame there is no separation between "culture", as a concept, from everyday life, as an activity. Their festivities and visual, textile, musical, ritual manifestations, seen as culture by westerners, are for them part of the objective and intersubjective imbrication that gives rise to the world. It is impossible to separate agriculture or mathematical knowledge from festivities or dance. To say that you have to take care of culture is equivalent to telling them that you have to take care of life, something that seems obvious and redundant.

In this sense, when asking rural educated Pame teachers in the city what their word for culture could be, the answer was peuk se tu'ueiñ kuan ("our way of living") (Felipa Montero, personal communication 2016; Lucía Reyes, personal communication 2013). By informally questioning people during assemblies, lunch invitations, walks, and other types of gatherings, on what things or actions could represent their way of living, the answer was always that it was " el costumbre " (the custom), that is social and religious rules and precepts all drive their social organisation and are closely related to life and seasonal cycles (among them, the agricultural one).

Culture for the Xi'ói is not placed, as in any given culture, in things but rather in the people; taking care of things does not make much sense because they transform, the same as people and their activities, what does not change is the seasonal cycle and the harvest, for example, and therefore all material/symbolic tools that are needed to be reproduced year after year should be kept at hand, whenever possible.

Subsequently, when trying to talk about the existence of a "national cultural heritage" and the existence of laws,

such as those concerning health, school attendance or land registration, which require that built cultural heritage and performative cultural heritage be protected and cared for by the State, we had other problems, raised by them more or less as the following: Are things yours or are they ours? Do you make decisions concerning things to be conserved and restored or do we make them freely? Why does the government say they belong to us but allocates money to take care of them? Or the opposite, why do you say they are yours, but you want us to do it without giving us money directly? (Schneider 2018).

This does not mean that there was not a good rapport between "both parties": traditional authorities (governor, the principales and other annual cargos) and INAH representatives. For example, while defining the scope of the façade's interventions, we had fruitful discussions on how much would be repaired and reintegrated; in general, inhabitants of rural communities want temples to look "brand new", because this implies that they have made money and thus, they can honour their saints with more luxurious and beautiful things. But because it is such a conservative community and, above all, because their daily life depends on the reproduction of activities that are related to the materiality of the elements of the church (elements that require "activation" in order to obtain good harvests or divine favours, for example), we reached an agreement in Santa María regarding which plasters would be worked on more; for example or, in the case of reintegration – although minimal and not very invasive – we decided to highlight the main iconographic motifs, without chromatically restoring everything, or falsifying the extremities of the images (of which we did not even have a historical photograph where they could be fully appreciated). I will give more details about this below.

This first approach was very important for what came next, although many of these questions remain unanswered and are still brought up from time to time, six years after all work on the temple was completed. The first CNCPC work season took place from October 2006 to January 2007. The plan was to return in September that same year, after securing sufficient resources to complete the façade and define the scope of the work inside the church.

2. The Nature of the Impacting Event

The Fire

In the early morning of 1 July 2007, a few months before beginning the second work period, lightning struck the palm roof of the building. Despite the risk, twenty members of the community broke down the main door to save the movable heritage. Santa María's people collectively mourned for about a month (fig. 5). Firefighters arrived several hours after notice was given to a larger settlement. By that time all the flammable material had already been consumed.

At dawn, a large number of the inhabitants of the Santa María Acapulco ejido were at the county town observing with grief the remains of their temple:

<<When I got there and saw what had happened, I thought it was the end of the world, that everything was coming to an end, it was as if one had their heart snatched away. The temple is one of the most important things in our village. All the people cried, men and women, it was a very dreary thing, as if life had ended (Crispina Montero, inhabitant of Santa María Acapulco, August 2007).>>

Given our closeness to the community thanks to the work that the CNCPC had carried out in 2006, the day after the disaster traditional authorities called me directly, associating me with the institution, as happens in such communities: one person takes over the position for everyone else. Similarly, the authorities of the state of San Luis Potosí notified central INAH and INAH's state delegation worked on addressing the problem immediately. On 3 July Architect Begoña Garay, from the INAH delegation in San Luis Potosí, and myself, gave a first opinion. After completing the technical work, we sat around the community offering to cry with the villagers and comfort them. That night we returned to the city of San Luis Potosí to plan the first response actions.

On 7 July we returned at the request of the governor of the state of San Luis Potosí, to accompany him as he delivered a speech where several immediate actions defined by a team of advisors to the governor and INAH were raised; among them, the most important, the placement of a temporary cover to protect the remains of the plastering, mortar and wall paint from the rain. The presence of the state governor contributed to generating a sense of hope in the community.

◄
Fig. 5. Mourning Offerings (July 2006). (Image by Renata Schneider)

▶
From left to right:
Fig. 6. A. Main Altar in 2006.
(Image by Gabriel Martínez)
 B. Main Altar in August 2007.
(Image by Renata Schneider)

Due to the fact that the INAH has disaster insurance that covers all of the nation's assets, we were able to obtain financial resources to return the material elements that support several of the Xi'ói's cultural traditions. Architect Begoña Garay was responsible for the architectural restoration and has also contributed important information to complete this case study. The work was divided into two complementary areas, since INAH administratively and legally separates the work of architectural heritage conservation, from that regarding movable and immovable property by destination (refer to note V). The first was conducted by Architect Garay and the other by myself, as a conservator-restorer. Subsequently, both areas generated equal projects in conception, objectives and goals, differing only in technical and administrative implementations.

Much damage was caused by the fire and the damage was often different in nature. The most damaged parts, from a structural and architectural point of view, were the choir, the roof and coffered ceiling, which were completely destroyed, and the circular wood beam enclosures of all the temple's bays, which were totally or partially scorched. The walls retained their structural capacity, thanks to their original strength and the newly integrated construction joints of lime-sand mixture on the stone outside which had been completed in 2005.

As for the destiny of movable and immovable property by destination, the doors, windows, altarpieces, pulpit confessional, were irreparably lost. The only exception was the mural decoration, of which 20 per cent was lost (it suffered profound changes in the tones of its pictorial palette as the pigments underwent a redox reaction, and some of the backgrounds, probably made of a mixture of inks and pigments, vanished completely); 80 per cent of the altars, baptismal fonts and plaster ornaments were lost (in several cases losing material integrity and decoration, and many times complete structural parts). Sacred objects, including sculptures, canvases, and textiles, among many others, were considerably damaged, as were graphic documents and several pieces of furniture, including benches, chairs, podiums, etc. In these cases, the damage was unequal and was treated in different ways, as will be explained later; but the community interest in the intervention process was driven by how soon things could be used rather than in a programme defined by the severity of their damage, although initially they all received first aid and stabilisation treatments (figg. 6A and 6B).

Due to lack of time, a detailed record of each part of the temple or of the salvaged movable property was not carried out. However, Begoña Garay gave a preliminary opinion of the structural damage, and an inventory and a series of general file cards for parts and immovable property by destination were produced, recording their problems and needs. This was required in order to request the advance insurance payment and to start work by mid-August at the very latest. After receiving the advance of almost $4 million (assigned almost entirely to the architecture area since its emerging actions were more vital), in January 2018, insurance and claims adjusters authorised the final budget that will be discussed later.

3. Post–Event Appraisals

With the first tranche of the insurance money, both areas were able to schedule the emerging activities to save the areas in danger of collapsing, almost 20 days after the event (support posts and trusses were placed where lintels and other enclosures had been burnt, accesses were blocked, damaged paint was veiled, and saved objects were separated, cleaned and gathered in one safe place, among other actions).

After this, and after the community removed the ashes from inside the church in August 2007, the emergent conservation work per se began in September, beginning with the placement of a temporary roofing sheet paid for by the government of the state of San Luis Potosí to protect the plastering and the altars that were at risk of being lost due to rainwater entering the nave. It should be noted that there was some delay in

Fig. 7. Pedro Duran and his drawing of the fire, August 2007. (Image by Imelda Aguirre)

placing the cover so certain elements of the temple, mainly the altars' sun-dried brick bases, suffered collapses and microbial deterioration.

It is important to mention here that the removal of ashes helped the inhabitants of the village to face the issue of the recovery of their property for the first time: Previously they were stuck in their grief and were somewhat in a state of paralysis, interrupted only by the rituals of "amends" and forgiveness to God and agricultural deities (especially thunder). The work was carried out only by the men of the community, although initially the movable property restoration team was allowed to suggest logistics and help. Per our recommendation, the community decided at the end of 2008 to mix the ashes with the materials of the new rammed earth floor (the placement of which was completed in 2009). During this work several human skeletal remains were found, which were also studied, registered and preserved. Similarly, on the main altar we found the remains of a cherub's face, which was restored in the 2011 season. The face was placed again on the reproduction of the main altarpiece in 2011, which generated great joy among the community.

The CNCPC requested help from the INAH's delegation in Querétaro, where there is a group of anthropologists specialised in the Pame ethnic group, so that during the festivities of Nuestra Señora de la Asunción, on 15 August, they would accompany us and carry out analysis of particular consequences of the fire for the community and, above all, explore what expectations the community had regarding the future of its sacred property.

To achieve this, the anthropologists carried out several unstructured interviews and a series of pictorial workshops with the children (fig. 7). The mission lasted about 10 days. The result of this work appeared in an essay published in December 2007 in INAH's journal Diario de Campo. Needless to say, this short season and its results largely defined the technical proposal for the intervention of the building and its objects

The disaster radically changed the conception of the project, not only from a technical standpoint. From this testimony, and as I have emphasised in the first

section of this text, one can deduce that for the Xi'ói "the church" is not only the material property, the building and its content (although it also includes it); it is the whole ceremonial aspect that constitutes it as a sacred space; as are the veiling ceremony, the dances to favour rain and fertility, the minuete traditional music, the placement of offerings, etc. On certain occasions, it even becomes the symbolic representation of the human body, with sections of the building taking the form of some organ or member. Unfortunately, destruction of the physical space and its material content also entailed the disappearance of a series of substantial community activities for the sociocultural reproduction of the group. <<We know that the temple will not be the same, but we want that the work done, such as that on the altar, is as close to what it used to be, with its carvings, with the same colours... although we also know that this is very difficult>> (Odilón García, principal, August 2007).

After the tragedy, it became evident how important it was for the community to reproduce the objects lost during the fire; especially those that entailed a very clear type of liturgical worship related to the "costumbre", such as altarpieces and their corresponding canvases and sculptures. Based on the testimonies collected during August 2007, we decided that it was essential, along with the restoration of the saved property, to recover most of the symbolic context of the temple that was placed in the matter consumed by the fire, as well as its general function and aesthetics, thereby contributing to return that which enables the cosmogonic and ritual presence in the indigenous sacred space. However, in conservation and restoration the reproduction of objects or spaces usually generates controversy in the name of material authenticity.

The work chosen to be carried out in Santa María Acapulco, was grounded on a good anthropological base, with specialists who guided us step by step on the scope of our technical activities and who asked the right questions to the right people, not only to the traditional authorities but also to various groups and contexts of people (rural teachers, farming groups, principals of the ranches, dependents on Santa María, etc.).

In México there is a whole legal framework that was established precisely as a way of systematising or guiding valuation decisions and this was another issue that both the architecture and the conservation-restoration areas faced, in addition to the "theoretical" dimension of the restoration itself and the anthropological and social elements that must define and solve a particular problem of this nature. For this, we must also rely on the charters, documents or treaties that México has signed or enacted on (such as the 1972 Federal Law on Monuments and Archaeological, Artistic, and Historical Zones or INAH's Organic Law) and, at the same time, reflect on the basis of those ratified or approved texts (such as the Athens and the Venice Charters or the Nara Document on Authenticity, The Riga Charter on Authenticity and Historical Reconstruction in Relationship to Cultural Heritage, among many others).

In the case of the architecture area, it was not necessary to justify the work to be done before INAH's Council of Historical Monuments because it consisted in structurally rehabilitating the building components (although the choir and the material part of the coffer would have to be redone also). The project was approved by INAH's central area almost immediately.

The CNCPC needed to elaborate a more detailed proposal to show that the reconstruction of altarpieces and other immovable property by destination was based on the basic premise that separation of material heritage and intangible heritage is artificial in this type of community (and probably anywhere else) and given that the main users of the temple were the Pame it was necessary to act according to their conceptions. The document was presented in November 2017 before INAH's Council for the Conservation of Movable and Immovable Property by Destination and after a few weeks of deliberation it was approved at the beginning of 2018. In this particular case, the Nara Document and The Riga Charter were very helpful, given that Mexican laws privilege the matter and are very conservative when it comes to reconstruction; in line with older charters such as those of Athens and Venice (the most important Mexican law, mentioned above, dates from 1972, although it has been modified a few times).

Fortunately, by these consensual and normative means – whether legally binding or not – it is possible to effectively regulate our work, making it a social obligation.

The following criteria were established for the intervention:

1) In the case of graphic documents and immovable property by destination that were totally or partially saved (mural paintings, altars, gypsum fleurons, clay and plaster figures on the façade, etc.), we decided to completely conserve them, minimising the restoration process, so that the remains of the temple and all eighteenth-century documents could be acknowledged immediately as historical remnants, even to the untrained eye. In this sense, only when mural paintings presented scenes with an important theological programme (both the strictly Catholic and the one that the Xi'ói have for every scene, which often do not have the same meaning – please refer to note VI for an example of this matter), were detailed but recognisable chromatic restitutions made, based on the pointillism technique.

2) Movable property that was subject to significant worship and was damaged during the fire (especially sculptures) underwent the least invasive conservation and restoration treatments possible; each process was identified and documented through photographs and drawings, but with a certain degree of mimicry, given the great significance they have for the community. A simple stabilisation treatment would not be meaningful in these cases. For example, not restoring the arm of a Virgin who grants her blessing during a specific celebration simply means that there is no celebration.

3) We decided that reproduced property was to be materially equal to the original, but no aging patinas of any kind were applied to them, so that they were easily identifiable as new. Also, a small hidden plaque was placed on each property, identifying it as an object that materially and formally reproduces one that disappeared in the 2007 fire, as well as recording the year of placement in the temple. The patina will gradually appear, but it will not constitute

false history. It is worth noting that in the reproduced coffered ceiling the original painted scenes were not included, since available photographs were not of sufficient quality to establish proportions, details in certain scenes or even chromatic spectrum. In that sense, it was agreed with traditional authorities that if the Xi'ói wish to re-paint the coffered ceiling with the original motifs, or some new ones determined by them, the decision will be entirely theirs and the INAH will not be further involved in the process other than at a consulting level. So far, they have not made a decision and every time we carry out monitoring visits, we discuss the issue. Most likely, what we need is more time to be able to come up with an agreement.

4) The church remained a functioning site of worship throughout the conservation process. For example, the community considers the church as an extension of the human body, as mentioned before, and thus we kept all medicinal offerings (eggs and corn, for instance) placed in different parts of the temple until they degraded naturally as is intended. We decided to move them during the working hours and return them to their original positions at the close of the day so that the offerings could fulfil their healing function during the conservation and restoration processes.

4. Response Actions, Timeframes, Resources and Costs

Ready to begin with long-term work, we decided to divide the project into annual periods of work of 3 and 4 months, so that we could gradually measure the results of our work (except for the first year during which we worked almost continuously to save as much evidence of the volumetric mortars and wall painting as possible), especially to:

Evaluate the community's acceptance of the processes by conducting open interviews with different groups of the community every year and observing consensus about the acceptance – or non-acceptance – of the degree of mimicry in the reproduction of certain pieces. For example, one of the altarpieces had two small carved figures that were hidden behind acanthus

branches: for the population of Santa María Acapulco they represent the temporary migrants who try to cross the border unseen into the United States; a lack of precision in the figures could involve a bad omen in the border crossing (fortunately it passed the test). Another example that we thought could cause conflicting views was the lack of colour reposition in the pictorial backgrounds after the restoration of the mural painting, since during the fire the polychromy had colour alterations and its palette was reduced; we expected complaints but there were none).

Analyse the transformations that took place in religious rituals and ceremonies involving each restored and reproduced object (coffered ceiling, roof, choir, altarpieces with their canvases, itinerant canvases for the blessing of cornfields, baptismal font, etc.). The anthropology team carried out most of this work. To mention an example, they recorded how ceremonies of agricultural appropriation were executed when there was no ritual space (that is, the temple) to perform dances and if these changed in form and substance when performed in different spaces, when they were later given access to the inside of the building, they were integrated in the same way that the costumbre dictated or they were given a new meaning.

Better understand the wishes and needs of the community regarding the use of certain damaged and not yet restored images, for example, and to be able to carry out temporary preventive measures for their veneration during a celebration.

Correct the course of work if community rules were transgressed or if it was necessary to establish new dialogues, etc. This turned out to be essential, since one of the most serious problems that both parties experienced (traditional authorities and the conservation-restoration team) was that we had to climb and step on the main altar – an absolutely sacred space – to work on it. What was even worse, was that many times it was women who did consolidation work in that area; forbidden for our gender (in this case, the second error was solved; the first was impossible to deal with but finally the traditional governor gave his consent, although several times he requested an amends prayer).

This division into stages, which to us as INAH specialists seemed fundamental (and that to date I believe was the right thing to do), sometimes caused much despair among traditional authorities and people in general because advances were very gradual. Nevertheless, they were firm advances, which did not make the project expensive. Once the temple was reoccupied at the end of 2009, that confusion gap was over.

Most of the architectural intervention work was carried out by members belonging to the community that responded to the work possibility announced by the INAH along with the traditional governor and the judge. Specifically, they worked on the replacement of the palm roof, the coffered ceiling and choir, since they have a more thorough knowledge of techniques used in building wooden structures, still valid in local vernacular architecture.

Bricklayers specialised in building restoration that have worked for the INAH for many years in different parts of the country and have learnt the trade by accumulating experience (divided into helper, official bricklayer and foreman) gave support with technical work for the consolidation of walls, parapet correction, and reintegration of wooden enclosures, since knowledge of masonry and restoration specifications, unknown locally, were required. In the case of restoration of objects and immovable property by destination, there was a team of professional restorers, some with a position in INAH, others hired, that varied between twelve people during the first three years and six in the following years, assisted by a team of ten people from the community always composed of the same members who had been trained by the CNCPC since 2006.

In the case of structural rescue interventions, the team began with the reintegration of wooden enclosures or lintels in the upper part of the bays where the original beams were scorched. Likewise, the adjacent stone detached from this area was mounted, as were several other areas that had lost movable elements. The crown of the upper parapet was also strengthened, and the battens and dormers were framed to support the coffered ceiling on the sidewalls of the main nave.

The cracks present in the nave's gable wall were also repaired, for this an extensive and comprehensive drawing register was needed (fig. 8). This intervention was carried out by injecting two vertical cracks present in both corners or ridges of the wall, in a downward path, 5 metres long. The intervention was complemented by integrating stone pieces as a sealing or "sewing", injecting a lime-sand fluid mixture. More than 600 litres of lime grout were injected per crack.

The roof reintegration process went through several stages (figg. 9a–9c). It is important to say that to date there is no similar reference – either in the Michoacán temples, or in those of the Huasteca or other nearby regions – where this covering solution is replicated: the first step was to gather a local work team. Using photographs of the original roof (obtained from different archives), and with the support of the then traditional governor and the ejido commissioner who

showed and distributed them among the different ejido rancherias, the INAH architectural conservation group was able to bring together several of those responsible for the ritual maintenance of the roof (many of them with experience in cutting and treating wood for external or local sale, and also, and specifically, in the placement of palm fronds for the church roof, a communal activity held every ten years). Thus, a first leading team, named at the time "Roof Reconstruction Committee", was put together. Begoña Garay, as mentioned before, was in charge of all this work.

This group was the one that brought together the rest of the cutting and preparation team, which was joined by young people from Santa María and the other villages of the ejido who worked with wood for the first time, and who served as apprentices. The team remained the same in general terms, with some member changes throughout the project.
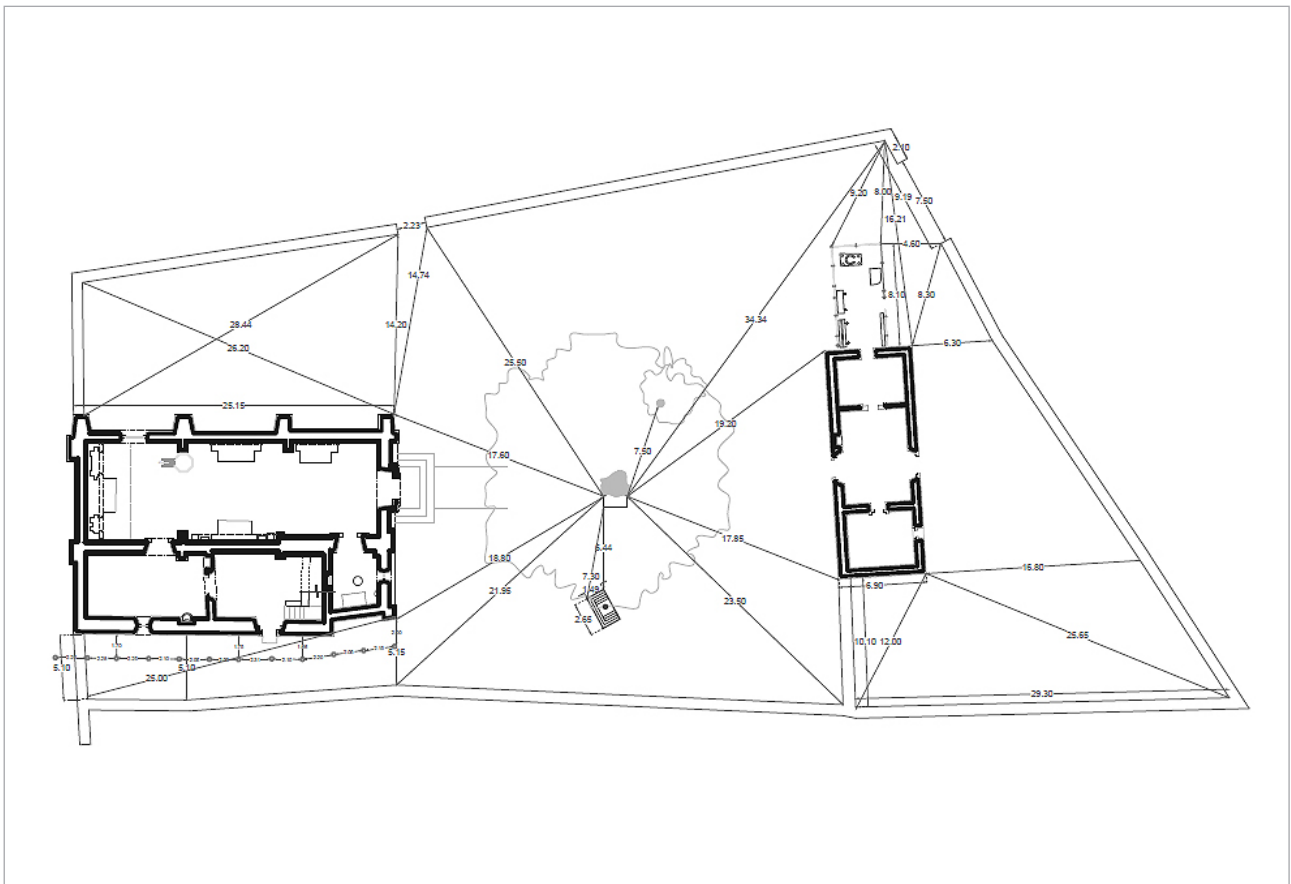

Fig. 8. Religious Complex. (Drawing by Begoña Garay)
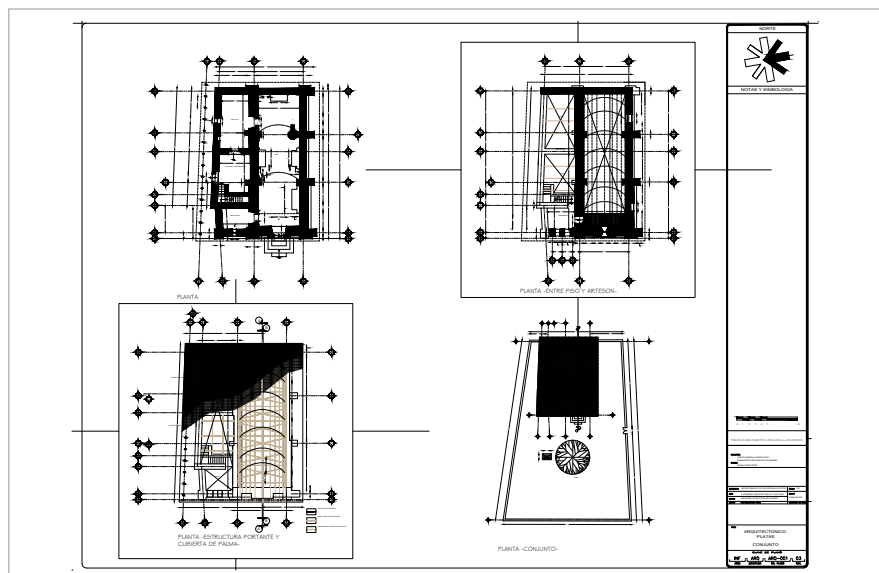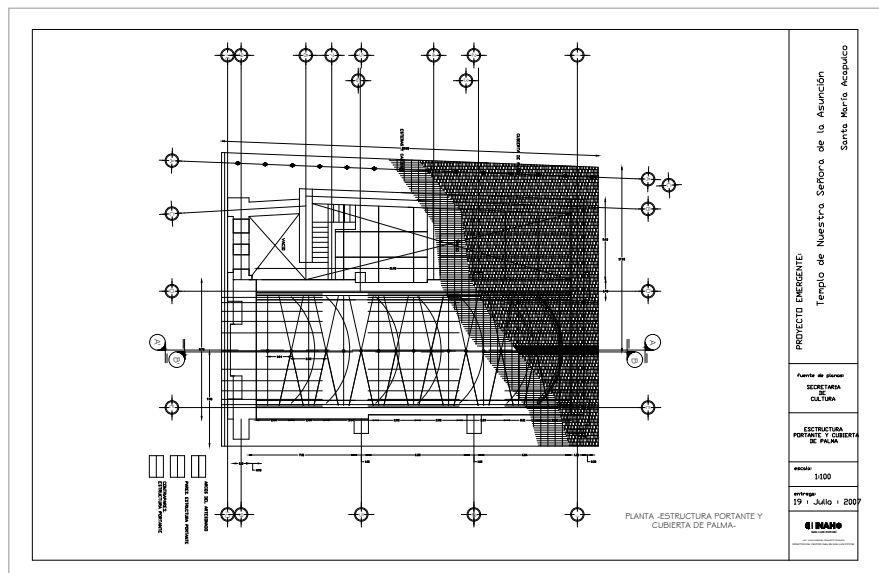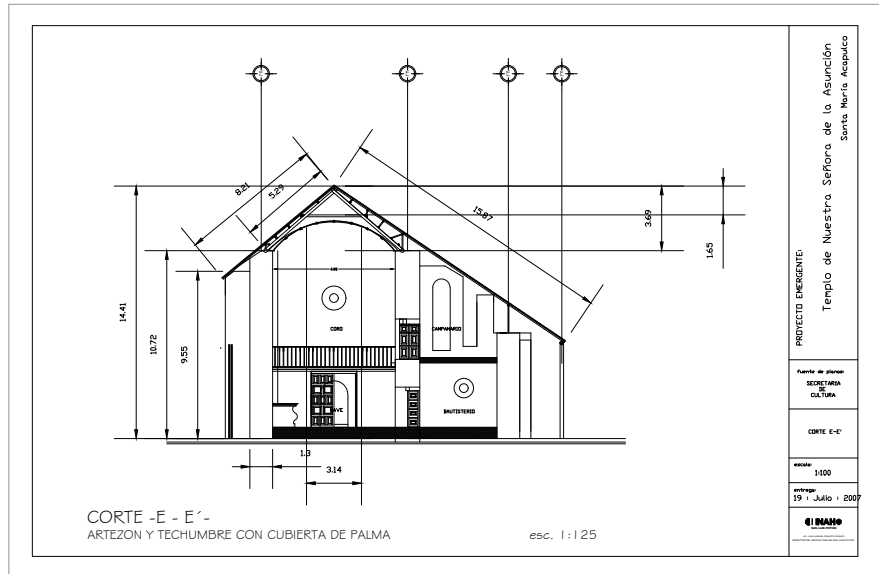
From top to bottom:

Fig. 9.

A. Plan of the wooden roof. (Drawing by Begoña Garay)

B. Plan of the wooden ceiling and the bearing structure. (Drawing by Begoña Garay)

C. Diagrams of the church's layout. (Drawing by Begoña Garay)

Based on a series of work meetings where the temple's photographs and records were thoroughly analysed, the basic work plan was proposed: wood cutting and preparation; main structure placement; secondary structure placement; rod collection and placement; palm frond gathering and drying, and subsequent placement (fig. 10).

Once the roof was finished and the first lightning rod was placed, the choir replacement began. For this work, Garay and her team made the most of a collapsed Montezuma cypress (*Taxodium mucronatum*), which was found in a place near Paso de Botello, a community of the ejido of Santa María Acapulco. The work to replace the coffered ceiling turned out to be more complex than expected, because no vestige or modulation of the truss (cerchón) was preserved for its own structure, nor was the modulation between sections. The only reference available was the inside of putlog holes in the gable and façade walls, where the built in of the joint stiles between trusses was still there, which did not comprise a regular arc shape. After an exhaustive work meeting with the team members and the traditional governor, it was determined that the modulation between longitudinal stiles should be equal to the one indicated by the putlog

holes, without "standardising" geometry and trace of the reconstructed coffered ceiling (fig. 20C).

Mesquite tree wood was used, since the coffered ceiling was originally made with it. This material was identified in a test carried out in 2004 for the government of the state of San Luis Potosí by Engineer Cruz León from the University of Michoacán de Hidalgo, a nationally renowned wood specialist, who at that time expressed an opinion on the state of conservation of the wood, since it was intended to replace almost all the beams.

As a final finish, a caulking layer or protective plaster coating, calcium carbonate, gelatin and rabbit-skin glue – all established as the base of the original preparation – were placed through the intrados by our team, this mixture was very similar to that of the altarpieces but without the application of Bol on the silver gilt (this could be determined through the micro-chemical testing carried out in 2004 on fallen fragments of the coffered ceiling).

Parallel to the architectural rehabilitation work, mural paintings and severely altered bi-chromed plastered surfaces were restored over 18 months (fig. 11). During

From left to right:
Fig. 10. Working on the Roof.(Image by Norma García)
Fig. 11. Conservation treatments in mural paintings. (Image by Juan José Beltrán)

▶
Images, Clockwise from top left:
Fig. 12. Mural Paintings: Chromatic Intervention Processes. (Images by Verónica Roque)
A. Old Picture projection
B. Decal
C. Pencil drawing
D. Final aspect

the last days of 2008 and throughout 2009, the scenes were chromatically restored based on acrylics and also with lime mixed with diluted sugars from cacti and mineral pigments applied using the pointillism technique on borders and repairs of lime, with sand and clay of the region. The reintegration was supported at all times using the photographic documentation carried out in 2006 (figg. 12A, 12B, 12C and 12D).

From September 2007, the four altars damaged by the rain were stabilised and volumetrically restored using the same kind of material used to build them, that is, sun-dried brick and lime and sand plaster (enabling them to be ready to receive their corresponding altarpieces). Likewise, three mortar elements were worked on, and the presbytery bench and the general floor of the nave,

the sacristy and the baptistery were consolidated and levelled. The façade was completed in 2012.

These activities were carried out *in situ* with the help of trained community assistants and professional restorers. Furthermore, in the CNCPC's workshops, all graphic documents, ranging from the seventeenth to the end of the eighteenth-century, were worked on. Due to the delicate nature of the paper and bookbinding intervention processes, graphic documents cannot be kept locally and require specialised materials and equipment. The same applies to the silk dress of the main Virgin of Dolores figure. In all cases, sculptures, for example, showed interesting data including clothing of the nineteenth and twentieth centuries, or even the use of originally masculine

images as virgins.

The processes on sculptures and canvases consisted basically, in the first case, of consolidations with rabbit-skin glue and polyvinyl acetate, according to each case and problem, repairs of calcium carbonate and/or sawdust mixed with polyvinyl acetate and reintegrations with varnish paint (figg. 13A, and B). In the case of paintings, since they were relined it was only necessary to do chemical cleaning, wax-resin repairs and reintegration with varnish paint.

In all cases it is necessary to observe the traditional use of surviving sacred objects and integrate it into the conservation proposal of each property. For example, and despite their importance, books are constantly manipulated, sometimes people even eat, smoke or drink near them, therefore, they must have thick and resistant bindings (whether or not they had them originally) to protect them during processions, since they are not (and are not intended to be) documents in an archive with controlled climate and limited access for consultation.

This is why the anthropology team worked around five aspects proposed by the restoration area. These were:

1) To identify the uses, interpretations and customs associated with the mural decoration, the images on the façade and the sculptures and canvases of the church; 2) To analyse the features of all the communal and individual offerings that are made in the church; 3) To determine what the Xi'ói think and expect of the temple's rehabilitation and of the possible transformations that could occur in the community after the work is completed (this considering the entire ejido, not only the main town); 4) To collect events, real and mythical, related to the use of the building and its sacred goods; and 5) To define the social and community implications of the prosecutor and sacristan, since they are the main managers of the temple and in charge of the manipulation of its objects.

Concurrently, and not less important, regular meetings at the municipal house or the atrium of the religious complex were held with traditional authorities to agree on preservation and conservation actions (usually the decisions on materials and procedures were determined by the INAH working groups, in those that the community recognised technical knowledge, but not so on the specific times or forms of intervention or the introduction of new preventive elements that they considered unnecessary and aggressive, such as the proposal to mount wooden racks in front of

From left to right:
Fig. 13. A. Intervention of sculptures. (Image by Norma García)
B. Painting after intervention. (Image by Martha Amparo Fernández)

Fig. 14. Consultation meeting. (Image by Diego Ángeles)

the altarpieces to avoid the proximity of candles and wooden pieces in the future, which took several meetings to achieve).[7]

Several workshops were held for elementary and middle school children on the function, effectiveness and meaning of the activities performed, an aspect that involved them in carrying out interviews with members of their community that were part of the team of conservators-restorers on the processes and intervention for their school homework, or the art historian and the CNCPC team on aspects of the foundation and history of the community.

Likewise, the community's traditional authorities, directly in charge of the sacred pieces, took two short courses on preventive management of sculptures during processions and dressing of sculptures. Thanks to the collaboration of anthropologists specialised in the Pame group, very precise ethnographies have been developed revealing much of the symbolic and functional dimension of the church and defining a significant part of the guidelines on how and for what reason each object and part of the temple was

intervened and presented (fig. 14).

A programme for "local heritage custodian children" was also implemented; it began with a playful exercise of discovering the pieces in 2007 and continued with a brief course on paper and graphic document handling and the making of follow-up logbooks, in addition to the assignment of an object or piece of furniture per child. This is not at all a local tradition; in practice, the sacristán is the one who should traditionally take care of the pieces, but this was suggested as a way to integrate the young population in the care of local heritage and as a way to have a written and continuous record of the conservation state of objects within certain periods of time. Although distrustful, the traditional authorities allowed the programme to continue and promoted the participation of children in the activities, although they stated that they do not plan to allow them to dress the images or "clean" them ceremonially. The programme was not completely successful: the literacy rate of children is as low as that of the elders: some write very well in Spanish (they are not schooled in their mother tongue), and others do not

seem to know how to do it, even if they are in the same elementary school year.

However, their interest in the subject was, and is, very broad, playful and committed (figg. 15A, 15B and 15C).

Back to technical matters, the reproduction work was not carried out by restorers but by professional reproducers chosen by the CNCPC Restoration Council's prior invitation, examining and direct awarding process. On 14 December 2009, the first reproduced altarpiece (of the Virgin of Guadalupe) was inaugurated and the building was reopened for worship. All sacred objects and figures were returned to its interior.

Specifically, the restoration work of movable and immovable property by destination included an intervention on two canvases, thirty-two wood carvings (including sculptures and furniture), an altar stone,

eight printed books of the eighteenth-century, nine parochial books (four of baptisms, one of deaths, three of marriages and one of the account and expenses of the mission), as well as the nineteenth-century copy of the title of the land composition of Santa María Acapulco, and a handwritten promise hidden in the sleeve of a sculpture. Work was also done on a silk dress from the end of the nineteenth-century. Four batons, several ceremonial pieces or of Catholic liturgy, two bells and a human skull were only subject to preventive action (all actions performed on each item can be found in the technical reports generated by the INAH. The file also includes examples of the intervention graphics and the conservation status of each cultural asset before the work was done) (fig. 1).

A total of 759.54 m^2 of mural paintings were worked on (162.73 m^2 correspond to the façade and 596.81 m^2 to the inside), in addition to ten volumetric mortar elements (façade figures, inside pyxides, among other

Images, Clockwise from top left:
Fig. 15. A. Pame girl during her custodian course. (Image by Renata Schneider)
B. Kids taking courses in 2008. (Image by Norma García)
C. A Santa María girl during a course. (Image by Norma García)

From top to bottom:
Fig. 16. Example of a register file
Fig. 17.
(Left) A. The façade in 2006. (Image by Renata Schneider)
(Right) B. The façade in July 2007. (Image by Renata Schneider)
(Bottom) C. The façade in 2016. (Image by Julio Martínez)
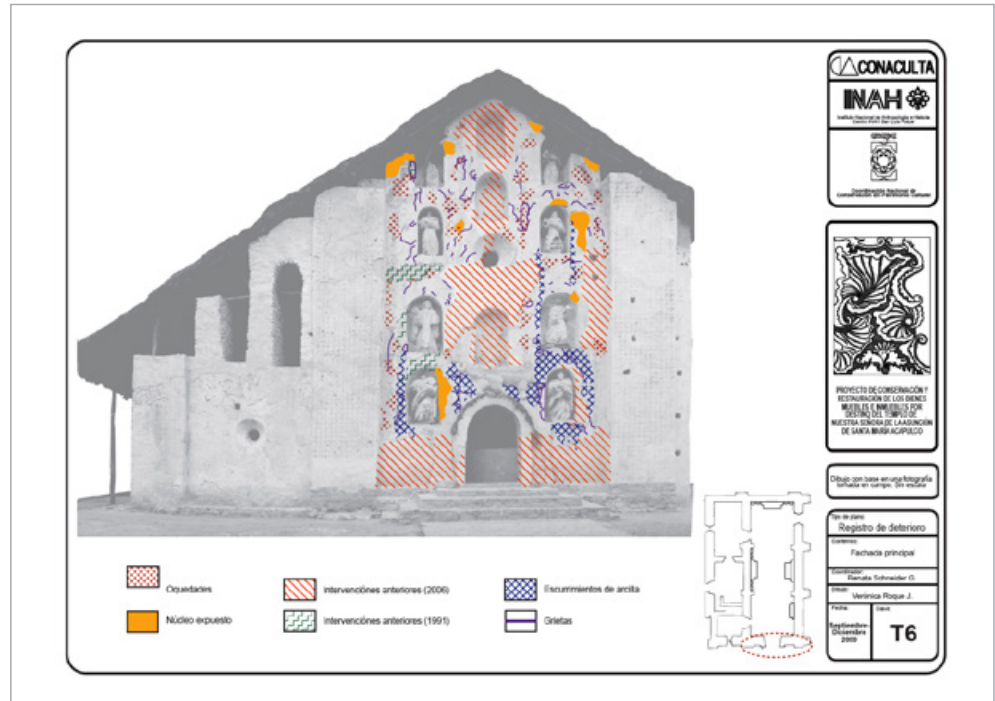
elements), a baptismal font, a holy water font that includes a relief in mortar and four masonry altars that serve as altarpiece bases (figg. 17A, 17B and 17C).

And finally, under the coordination of the movable property team, four altarpieces were reproduced, with their respective canvases or corresponding panel paintings. In the case of the altarpiece of the *Seven Sorrows of the Virgin and the Passion of Christ*, a copy of the sculpture of the large crucified Jesus, of the images of the Virgin of la Asunción and San Francisco in the

main altarpiece were also made, in addition to a pulpit (ambon and canopy), and a painting of the Virgin of Guadalupe. The main door, the access door to the chapel of rest (or pre-sacristy) and the window-lattice of the presbytery were also reproduced by local carpenters. The temple continues without electricity, as always (figg. 18A and 18B).

In 2011 the government of the state of San Luis Potosí installed a lightning rod in the north-western corner of the atrium, which was concealed as much as possible.

◄
From top to bottm:
Fig. 18. Detail of the altarpiece of the *Seven Sorrows of the Virgin and the Passion of Christ* A. Original, December 2006. (Image by Gabriel Martínez) B. Reproduction, March 2013. (Image by Julio Martínez)

▲

From left to right:
Fig. 19. A. Offerings on re-consecration day; January 29, 2014
B. People visiting their temple on the day of its re-consecration, 29 January 2014.

The church was officially re-consecrated on 29 January 2014. To correct possible logistical and cult-related issues, a list of festivities and a mixed custody and maintenance programme for celebrations and Sundays have also been carefully scheduled, although it has not been completely fulfilled. Concurrently, the community, through its principals discussed and is slowly "building" a renewal of the "costumbre" (an aspect they believe is the most immediate positive result of the fire: a possibility of ritual renewal firmly anchored in the tradition and objects that reflect it. Very soon it will be time to research and register these changes, since the first six years since the work was concluded have already passed) (figg. 19A and 19B).

After the fire, the patron Virgin of the village flew away and took shelter at the church of Tancoyol, a mestizo community (but of Pame origin) in the neighbouring state of Querétaro. When the restoration was finished, she returned to her place inside the temple and found herself at home. The people of Santa María Acapulco saw her "in the form of a beautiful bird" when she left,

and also when she returned (Heliodora Rubio, personal communication 2014; Hugo Cotonieto, personal communication 2016).

The documentary material produced by the CNCPC project was handed to the community in reports divided by seasons that gradually describe the technical advances of the work. These reports are delivered both physically and digitally. The printed material is stored in a wooden box that is kept in the church along with all other religious artefacts, furniture and pieces. This is done this way because usually the Pame do not handle paper documentation, which usually deteriorates quickly in houses, where there are no cabinets or furniture, and each person's official documents are stored in simple plastic envelopes that hang from the walls along with farming tools. The traditional governor's house/office does not function as a legal estate either, so keeping them in the church is the most appropriate thing to do, next to the chest where the already restored historical documents are kept. In 2015 they were also given an inventory of all cultural objects

belonging to the church and sections on the historical background and art history, the results of the physical anthropology tests and the three texts resulting from ethnographic work and applied anthropology.

All this documentary collection is also available for open consultation at the CNCPC and at the INAH offices in San Luis Potosí (except for the inventory, whose consultation depends on the express approval of the traditional authorities).

Every year an inspection visit by the CNCPC takes place; we do not interfere in any way if not consulted, we just record and describe the changes and the state of conservation of each object. So far, the agreement is simply to monitor; the temple has once again become the subject of conservation exclusively for the community. Issues such as the pictorial future of the coffer and the installation of light inside, continue to be a matter of mutual debate.

The estimated total cost of the project was MX$20 million of that time (approximately US$1.2 million). MX$16.6 million were destined to implement activities

under my supervision, while the rest went to the architectural rehabilitation of the temple and parish building conducted by Begoña Garay (figg. 20A, 20B and 20C).

5. Outcomes and Effects

The temple of Santa María Acapulco is not composed of a structure, its architectural finishing and/or of a series of movable or immovable property by destination; above all it is the core of Xi'ói every day and festive life. Each object has a reason for being and a specific use, and each corner symbolically represents spaces of the family home, the cuamil (slanted field), the hills, the territory of the ethnic group or the world.

I hope that the Santa María Acapulco project shows why it is important to institutionally and federally envision the conservation of the cultural heritage of marginalised indigenous settlements and of course, how to proceed in cases of disaster that can lead to reconstruction interventions of symbolic and material spaces. If it is not possible to work in other places as thoroughly as it

has been possible to work in this case, it can be done through courses where the conservation of the legacy of each site can be viewed from a perspective that includes both pedagogical, evaluative and social development aspects, as well as of preservation, restoration and maintenance of cultural goods, so that communities are supported to carry out the necessary cultural changes, from their own perspective and paths, providing them with certain basic management elements.

In cases like these, it is also vital to avoid, as far as possible, seeking methodological delimitations aimed at satisfying professional and institutional needs and, instead, to take time to describe the social realities found. That is, do not try to standardise concepts and methods, but try to standardise analysis and meeting processes. To take time in meetings and processes is obviously very difficult and faces the increasingly constant language of institutions' administrative indicators and regulatory concepts. However, allowing the long-term analysis of the greatest number of everyday and religious aspects of such a group, gives us the opportunity to glimpse what rural communities look for in the restoration of their worship objects and in

turn allows us to communicate what we want from the conservation, rehabilitation, restoration or reconstruction of a monument as representatives of national agencies.

One issue that remains to be explored is the vertical relationship that always exists when one party provides work for another, or manages the money, such as happened here where a federal institution paid for the entire work and recovery process of the temple and a large part of the local population received a salary. For example: Did the traditional authorities and the community accept our suggestions for fear of losing work or help? How is it possible to detect this if the anthropologist who conducts the interviews is part of the group that holds the resources? Now, some time after carrying out the work, is it perhaps appropriate to start this type of anthropological survey? So, although we tried to minimise it, it is a process that existed and that should be reviewed: to believe that after doing work of this nature (and for such a long time) we do not contribute to the social and economic tensions of such a poor community is a mistake. On the contrary, it is an aspect that must be better analysed and reflected upon: marginalisation should

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From left to right:
Fig. 20.
A. The temple nave in 2006. (Image by Gabriel Martínez)
B. The temple nave in 2007, after being struck by lightning. (Image by Renata Schneider)
C. The temple nave in 2015. (Image by Renata Schneider)

not be seen as that which enables cultural otherness and the conservation of symbolic contents and objects themselves, it is the representation of very deep material deficiencies that must be taken into account in any intervention. When possible, we should think of alternatives to minimise it.

Likewise, during the intervention, we did not delve into the distances that exist between the ideas an institution may have about a reconstruction process and the way they are reinterpreted locally, as is the case with any government programme in this type of community for the community do we rebuild, recover or rehabilitate? Is that difference important to them? Do they have their own words to describe the process or the notion of reconstruction? Do they consider it important to name it? It would be vital to know how the process is interpreted locally today, in five years' time or more after its conclusion.

Another vital point in the discussion has been to confirm that the tangible cultural heritage found in settlements with high rates of economic marginalisation, although it has managed to survive over time especially thanks to its important role as a means of regional, social and cultural cohesion, has gradually lost weight in the face of the new social processes that marginalisation itself and mass migration produce and develop in the country. So, our job as part of a federal institution dedicated to culture is not to preserve at any cost the traditional customs of a settlement, but to ensure that these transformations follow internal decisions and not exclusively external forces.

I wanted to show some of the aspects that could be followed nationally in terms of planning and organisation, after a long-term analysis: the recognition and respect for traditional technical knowledge of the community and its use; training of inhabitants in preventive conservation of their heritage; the approximation to the multiple senses embodied in heritage; integration of young people in the traditional custody of heritage (either by existing means in each community or through "new programmes"); empowering workshops based on heritage symbols; and collaboration with social science areas in the

definition of processes and scope, etc., show other non-traditional ways of developing the discipline of conservation and restoration, etc.

The essential idea, in any case, is to generate an inter-institutional work model that ensures that once technical interventions have been carried out after big disasters, both the communities, as well as the other government agencies and institutions related to the care and dissemination of the heritage of a locality, can work together on certain common goals that do not interfere with the ritual and daily use of cultural property, an aspect that only the Pame, in this case, had the responsibility to define: all the INAH team thank the inhabitants of Santa María, and the great and beautiful bird that agreed to come back to her temple when the intervention was completed, for the trust granted to us (fig. 21).

6. Details of the Expert Completing the Study

Renata Schneider is a senior restorer from the Instituto Nacional de Antropología e Historia of México, where she has worked since 1993; devoting herself to the management, conservation and restoration of sacred heritage in rural and indigenous communities and to the conservation and restoration of mural paintings, earthen architecture and architectural ceramic materials. She holds a BA in restoration from the Escuela Nacional de Conservación, Restauración y Museografía "Manuel del Castillo Negrete", as well as an MA in political philosophy from the Universidad Nacional Autónoma de México (UNAM). She specialised in ceramic materials applied to architecture at the Museu Nacional do Azulejo, in Lisbon, Portugal, and in ethnographic research techniques at the UNAM's Instituto de Investigaciones Antropológicas. She has twice received the "Paul Coremans" award for the best conservation and restoration.

Fig. 21. The Santa María Temple after the intervention. (Image by Renata Schneider)

Notes

1   INAH is the institution in charge of protecting Mexico's cultural heritage, with almost 6,800 employees. It has local offices in each state of the country and some central instances settled in Mexico City.

2   See fig. 6B.

3   The palm was ceremonially renewed every ten years until the authorities of the state of San Luis Potosí began to pay the people of the village to do this, supposedly in order to preserve the "Pame culture", and deeply altering the community organisation, to the point that if people did not receive money, they refused to participate in the renovation. It should not be forgotten that liquid money is a highly sought-after resource in the *ejido*.

4   It is important to mention that having experienced lightning strikes at the beginning of the past century, it is very hard to believe that when the INAH and the government of the state of San Luis Potosí took over the protection of the building, more or less around 1970, they did not place a lightning rod, but alas, they did not.

5   That is, altarpieces, mural painting, decorated mortar, carved doors, lattices, tiles, etc.: non-architectural elements but inextricably associated with architecture and considered as "immovable property by destination" or "furniture associated with immovable property" by Mexican law in the matter.

6   The ethnonym Xi'ói gives an account on the Pame in the area of Santa María Acapulco (Pame being the exonym; which also designates the inhabitants of the other geographical pole of the ethnic group, that of the Xi'uy, towards the area of Ciudad del Maíz, Alaquines and La Palma, San Luis Potosí, where approximately another 7,000-8,000 members of the ethnic group live).

7   For this one occasion the traditional governor remained in his position for three additional years, until the inauguration in 2009 of the first altarpiece.

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+++ For further inquiries about this work we recommend visiting the following website (there are also several academic papers published, which are easy to access and consult on the internet, and all technical work reports by season can also be found in the archives of the CNCPC, the INAH SLP Center, the archive/library of the municipality of Santa Catarina, SLP and the "report chest", protected in the temple of Nuestra Señora de la Asunción):
http://youtu.be/s-HUT4JvOC0.
Medios INAH dissemination video on the conclusion of the conservation, restoration and rehabilitation of the temple of Nuestra Señora de la Asunción de Santa María Acapulco, Santa Catarina, S.L.P. February 2014.

ICOMOS-ICCROM

ANALYSIS OF CASE STUDIES IN RECOVERY AND RECONSTRUCTION

The Joint ICOMOS-ICCROM Project "Analysis of Case Studies in Recovery and Reconstruction" sought to harness the knowledge and capacities of both bodies to explore how best to learn from experience. Its objective was to clarify issues of recovery and reconstruction and to provide insights that could improve guidance. The project involved the commissioning of a range of case studies, chosen to represent a comprehensive set of factors, namely geographical, cultural and causational. The project was managed through a joint Working Group comprising members of both organizations and administered through both the ICOMOS Secretariat and the ICCROM-Sharjah Regional Office.

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