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# PREVENTIVE CONSERVATION OF THE MONUMENTS IN MERV, TURKMENISTAN

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**Theme 1:** History of the earthen architecture in Asia and other related region

**Sub theme 1.1:** Archaeological sites and historical monuments

**Key words:** archaeology, preventive conservation, earthen architecture

## **Abstract**

This article describes the various activities developed in Ancient Merv between 2001 and 2007 by the International center for Earth construction (CRAterre-ENSAG), in close collaboration with the National Department for the Protection, Study and Restoration of Historical and Cultural Monuments, Ministry of Culture of Turkmenistan (DPM) and the University College of London (UCL, Institute of Archaeology), to develop a preventive conservation strategy for this World Heritage Property.

The philosophy of this collaboration was to strengthen the capacities of the Turkmen specialists in the field of conservation for a better preservation of the unique monuments and precious archaeological remains. The working methodology integrated research & experimentation, capacity building, supply of equipment and improvement of conservation/management practices. This article comprises four main sections. The introduction presents the general context of the site, the second part explains the conservation principles adopted, the third part describes some interventions on the monuments and the last part presents the training activities undertaken.

## **1. CONTEXT**

The Merv oasis, located at the intersection of the Murghab River and one of the major west-east trade routes to Bukhara and Samarkand, occupies a vast area of 1200 hectares on the flat landscape created by the alluvial delta fan of the Murghab River. A series of four adjacent walled cities of different periods testify of the importance of the oasis, founded in the 6<sup>th</sup> century BC, which became an imperial capital city during both the Abasid (8<sup>th</sup> century) and the Seljuk (11<sup>th</sup> -12<sup>th</sup> centuries) periods.

Important monuments, including the prestigious mausoleum of Sultan Sanjar (12<sup>th</sup> century), the greater and lesser Kiz Kalas as well as more than 1000 hectares of well preserved buried archaeological deposits contribute to the unique character and significance of the Park.

A year after the inscription of Ancient Merv on the World Heritage List of UNESCO, in 2000, important conservation problems were identified by the national and international community. The UNESCO World Heritage Centre set up a mechanism to respond to

these concerns. In the meantime, the World Monuments Watch inscribed the site on the world's 100 most endangered sites.

Between 2001 and 2007, CRAterre-ENSAG was regularly invited by UNESCO to work in close cooperation with the national and international partners<sup>2</sup> on conservation and management issues, with the view to better tackle the problems affecting earthen structures and strengthen capacities within the Turkmen team. This long period was a great opportunity to share experiences between various international and Turkmen teams, and allowed the gradual fine tuning of the conservation techniques in Merv, resulting in a range of innovative solutions based on a preventive approach.

## **2. PHILOSOPHY OF INTERVENTION**

After assessing the efficiency of previous conservation campaigns and experimenting various conservation approaches with the Turkmen and English partners, it was recognized that only a slow process with long-term perspectives would be effective for the site. This option took into consideration the size of the protected area (1200 hectares) and the complex decay factors affecting the monuments and archaeological deposits, which include the raising of the water table (since the 1950s), when the Karakum canal was dug to increase cotton production in the region. The target was to gradually develop specific conservation techniques, adapted to the local context and according to the international conservation charters while emphasizing on capacity building amongst the Turkmen staff in charge of the site.

The key principles driving the conservation approach were the following:

### **Respecting values**

The site conveys very important historical and archaeological values. Thus, all interventions, based on consistent scientific documentation, should result in a preserved archaeological resource respecting the state of conservation of the ruins.

### **Maximum understanding**

The first step was to analyze the decay processes affecting the structures and the level of threat attached to each of them. Pathology surveys and comparative analysis with archival photographs helped to identify both environmental and human decay factors, and to measure their complex inter-related effects on the monuments. To confirm the hypothesis provided by the site observations, a monitoring system was launched to measure several parameters (physical, climatic, environmental, and human).

Additionally, a soil laboratory was established to analyze the characteristics of the different types of soils constituting the monuments and those supplied by the quarries around the site. For this purpose, UNESCO provided a new building with laboratory equipment, and two staff members were trained on soil analysis. Continuous field observations helped to evaluate the behavior of the soil mixtures selected and the efficiency of various preventive conservation techniques experimented.

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<sup>2</sup> National partners: National Department for the Protection, Study and Restoration of Historical and Cultural Monuments, Ministry of Culture. The Ancient Merv Park. International partner: Institute of Archaeology, University College of London.

### **Adapting to the reality of the field**

Priority was always given to solutions that could easily be applied by the Turkmen team with their own physical and human resources. This meant that conservation programmes had to make use of local materials and take advantage of technologies that could easily be applied by the Park staff with their available equipment.

### **Use of original materials**

The applied interventions basically made use of soil only, to produce the same bricks and mortars as those found in the original structures. The only added material was geotextile, which was sometimes integrated to separate the original fabric from the conserved part, especially for the backfilling of excavated sites. The use of burnt bricks and cement mortars was abandoned.

### **Reversibility**

The conservation activities carried out during the Soviet period and immediately after independence showed that heavy interventions are not effective in the long term, and could even be very destructive.

The conservation of earthen structures is a fast evolving field and the idea of reverting back to previous stages should always be kept in mind. Interventions should be removable without damaging the original structure. This criterion is closely linked to the others, and reduces the risk of uncontrolled decay processes taking place after the intervention. However, a long experimental phase is required to guarantee a safe application of this principle.

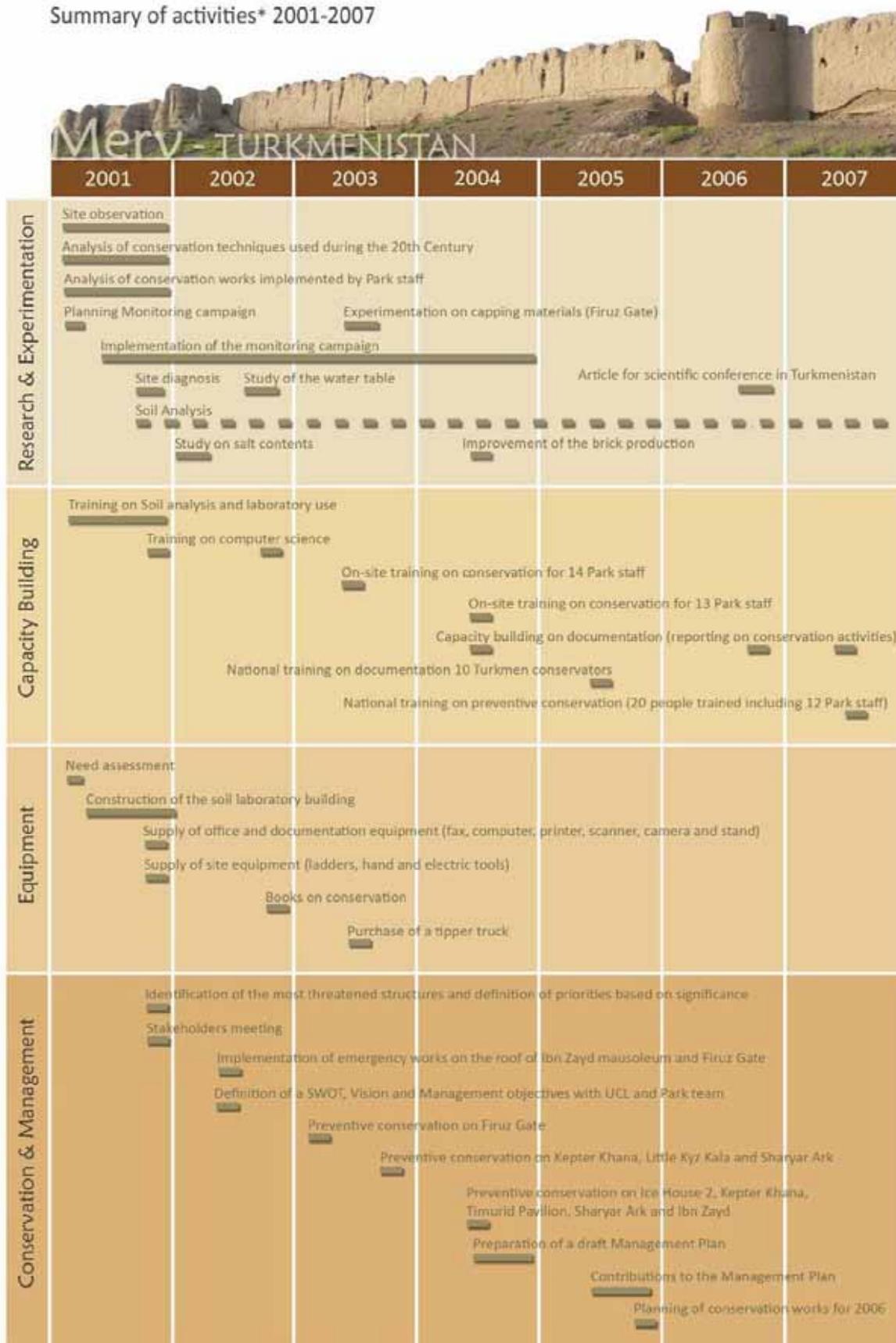
### **Avoiding confusion between original structures and contemporary interventions**

While ensuring that interventions are reversible, they also have to be discrete, and added materials have to blend with the original ones. Additions or repairs have to be slightly distinct from the original fabric but not conspicuous, even if the physical properties of both materials are similar.

### **Minimum intervention**

Several preventive techniques were explored and experimented. The first results show that minimal interventions can result in considerable savings if they are properly scheduled and implemented. Between 2000 and 2008, only the most threatened structures were treated with minimal interventions. Less critical interventions have been postponed until they can be handled in the future, to make sure that available resources are used to address, and reduce the list of threatened monuments. This has resulted in scattered and almost invisible interventions, as compared to the prestigious restorations that are sometimes implemented on isolated structures.

## Summary of activities\* 2001-2007



\* Only activities involving CRAterre are inserted in the table. Many more results have been achieved during this period in Merv.

### 3. PREVENTIVE CONSERVATION WORKS EXPERIMENTED

The development of tailored conservation techniques for Merv is a slow and endless process. At the beginning of the programme, it was decided not to touch any of the prestigious monuments of the Park. Only the roof of Ibn Zayd received emergency repairs during the second year, to prevent its collapse. All conservation techniques tested in Merv had already given excellent results in other parts of the world where similar sites are found (Uzbekistan, Iran, Syria). Despite this guarantee, the first conservation interventions were implemented on elements that are not considered as prestigious or unique in Merv. For example, capping techniques were first tested on city walls for 2 years before being applied to standing monuments.

The following paragraphs describe the most efficient technique implemented:

#### **Removing plants and vegetation:**

Great effort was made to address the problems caused by vegetation growth all over the site, a feature that considerably accelerated the erosion processes. Vegetation affects the wall bases by changing a hard and dense material into a porous one, which can be easily washed away. It also reduces the drying process of the wall by retaining humidity in the ground. In addition, there are problems related to plants growing in the mortar joints. By simply removing vegetation from a monument and its immediate surroundings, it is possible to increase the life span of the structures by several decades. It is also possible to prevent further wearing away of gullies, holes and cracks or to prevent the collapse of arches by applying sacrificial mortar layers in such a way that the effect of erosion on the entire structure is better spread.



Fig. 1 - Ice House 2 – Removal of the plants on the building and its surroundings

#### **Sacrificial mud renders:**

To reduce the speed of erosion of fragile walls, domes or vaults, sacrificial layers of mud mixtures were applied on the most exposed surfaces. These mud renders endure the erosion instead of the original fabric. This method was first implemented in 2002 on the Ibn Zayd mausoleum where a traditional earth coating was applied to protect the domed roof, instead of the previous destructive cement coating which had led to serious humidity related destructions. In 2004, the tops of the walls of two other monuments - the Kepter Khana in Shahryar Ark and the Timurid pavilion - were treated in the same manner.



Fig. 2 - Applying sacrificial renders at the top of ruined walls to reduce the speed of erosion



Fig. 3 - Ibn Zayd mausoleum – Sacrificial layers of mud mixtures are applied to protect the domed roof instead of the previous destructive cement coating

### Peripheral drainage

Gentle drainage slopes have been created along eroded walls where deep undercuts were observed. This was done to reduce humidity related problems due to the excessive humidity in the walls. Surface drainage channels have also been designed to divert water away from the sensitive structures.



Fig. 4 - Peripheral drainage along the walls of Ibn Zayd mausoleum and Shahryar Ark palace

**Reintegration of masonry elements:**

For walls presenting very deep undercuts, the bases were partially reconstructed to prevent their collapse. Special attention was also given to voids in monuments, which were likely to be the starting points of critical puncture erosion processes, generally leading to serious conservation problems for the whole building. This was the case on the “Timurid pavilion” and the “Ice House 2” where there was a real emergency situation and several holes had to be filled in order to prevent imminent collapse.



Fig. 5 - Reintegration of masonry at the corner of an eroded wall 2007

Reintegration was also carried out on damaged domes, including one dome on the Ibn Zayd mausoleum, and the dome of the Ice House 2. Masonry was reintegrated into the structure with the same bricks, following the same bonding patterns. The reintegration of masonry should not be seen as a straightforward masonry job. It is quite a difficult task because the added brickwork had to bond perfectly with the original structure. This was achieved by working slowly and carefully to prevent fast setting and shrinkage of the added brickwork.





Fig. 6 - Ice house 2 - Reintegration of the masonry on the damaged dome in 2004

Numerous other preventive conservation solutions have continuously been designed since the beginning of this programme. They are tested at small-scale, over a sufficiently long period of time, allowing for fine-tuning and adaptation to local conditions (materials, skills, weather ...) before being implemented at a large-scale.

#### 4. TRAINING COMPONENTS

This methodological approach was designed with the Turkmen personnel of the Park who were involved in each activity: from the first site analysis to the experimentation of preventive conservation techniques. Two regional training courses were organized in Merv and a third one at the Kunya-Urgench World Heritage site, to enlarge the diffusion of the knowledge to the Turkmen professionals working on the eight historical and cultural national Parks. They have a better understanding of the conservation problems encountered on earthen heritage and are able to develop and implement their own ingenious conservation techniques. At Merv, a great number of interventions have been implemented by the Turkmen staff on various typologies of structures, including ruined city walls (Abdullah Khan Kala, Bairam Ali Khan Kala) and standing monuments (Great Kyz Kala, Ibn Zayd). The improvement of the conservation practices can also be observed on other sites such as Gonur Depe, Olug Depe, Nisa and Kunya Urgench.



Fig. 7 - On site training sessions comprised documentation, practical works, preparation of illustrated reports and theoretical classroom sessions



Fig. 8 - Participants to the regional training course in Merv, June 2007

## 5. CONCLUSION

This cooperation programme, involving a wide range of professionals from all over Turkmenistan and Europe, was an excellent opportunity to share experiences and move a step forward in developing adapted conservation responses for this challenging site. The joint team developed innovative links between archaeology and conservation, which did not exist before. The Turkmen professionals in charge of ancient Merv, as well as their colleagues working in other significant Turkmen sites, have become more effective and confident in their work as a result of the skills and equipment transfers. The previous inadequate conservation techniques, inherited from the conservation of burnt brick monuments have been totally abandoned. The physical and mechanical properties of earth are now better understood, and the Turkmen professionals and artisans make high quality bricks and mortars. Several rainy seasons will be necessary to assess the efficiency of the proposed protections, but the first trials are promising. Useful information on how to monitor the structures, how to document them for conservation, and how to select materials have been gathered by the trained professionals. It is now possible to embark on larger and more ambitious conservation projects for sensitive monuments, such as the two Kiz Kalas for which a project document has been established by the partners.

Merv offers a unique opportunity to work simultaneously on different types of structures and develop a variety of responses fitting each situation. Most of the conservation problems observed on the monuments and archaeological sites in Central Asia can be found in Merv, thus the experience developed here over the following years will certainly benefit other sites in the sub-region.

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## **Curriculum**

David GANDREAU is an archaeologist who has worked at CRAterre since 2002 as a project manager specialised in conservation of earthen heritage. He is the Coordinator of the CentralAsianEarth programme. He is responsible for the research theme "Archaeology and conservation" of the scientific programme of CRAterre-ENSAG.

Sebastien MORISET, architect specialized in the conservation of earthen architecture, has worked at CRAterre-ENSAG since 1993. In addition to a long field work experience, he has developed conservation programs, management plans, and World Heritage nomination dossiers for a range of sites in Africa and Central Asia. He is responsible for the research themes "Conservation techniques" and "participative management" of the scientific programme of CRAterre-ENSAG.