



EARTHEN ARCHITECTURE

ABSTRACT

Our earthen architectural heritage is rich and complex. A ubiquitous form of construction, earthen architecture appears in ancient archaeological sites as well as in modern buildings, in large complexes, historic centers, individual structures, and decorated surfaces. At microscopic and macroscopic levels—and on physical and social planes—earthen architecture is vastly varied. Thus a range of disciplines in study, research, and practice are associated with its conservation.

The field of earthen architecture conservation has grown tremendously in recent decades. This development is reflected in a series of international conferences devoted to the preservation of earthen architecture, the first in 1972 in Iran and the latest in Mali in 2008. With each conference, the number of participants has increased along with their geographic and professional diversity. Academics, scientists, architects and conservation practitioners, united by their interest in earthen architecture and conservation, now convene every few years to discuss chemistry, soil science, seismology, hydrology, structural engineering, archaeology, sociology, and sustainability, as they pertain to the study and preservation of earthen architectural heritage.

Ever since humans began to construct homes around 10,000 years ago, earth has been one of the most widely-used primary materials. People build with earth in geographically diverse locations around the world, and today more than a third of the world's population lives in an earthen building¹. 10% of the UNESCO World Heritage Sites are earthen sites; however more than half of those sites (57%) are in danger and need either emergency intervention or a comprehensive management plan.

Although earthen construction has been widely used for centuries, it has been a subject of criticism due to a series of misconceptions. Some commonly held misconceptions are that earthen architecture is limited in technique, obsolete, a last resort when no other building materials are available, practical only in dry weather, and particularly vulnerable to seismic events.

On the contrary, the architecture from several civilizations has shown that earthen construction has been selected by choice. When the Spaniards arrived in Peru, they continued using stone as their primary construction material based on their own traditions as well as local expertise; however, they soon discovered that earth—as used by ancient civilizations in the region—was a better construction material to withstand seismic events. In Lima, where earthquakes have always been part of the city's history, thicker adobe walls were used for the first floor and very flexible wood-framed earthen walls were used on the second floor. This mixture of techniques has allowed historical buildings to survive earthquakes for more than 300 years. The historic fabric of earthen buildings—including the raw building materials, as altered and assembled to form buildings—represents the modification and manipulation of natural materials by human labor. Therefore the preservation of earthen architecture is not only the preservation of earthen buildings, but is also the safeguarding of traditions and human ingenuity used to adapt the built environment for specific needs.

¹ According to the United Nations, 30% [2 billion people] of the world population live in earthen buildings.





OBJECTIVES

As a result of this session, the participant should be able to:

Classroom lecture:

- Recognize the significance of earthen architecture in the development of various cultures around the world.
- Understand the diversity of earthen construction techniques.
- Identify the reasons that our society does not better promote and use earthen construction.
- Recognize the relationship between the preservation of earthen building traditions and the preservation of earthen sites.

CONTENT

Classroom lecture:

To meet the objectives of this section, the instructor will present:

- Introduction to the history of monumental earthen sites worldwide
 1. Earthen architecture in the Middle East
 - a. The origins of mud-brick construction in early civilizations: Jericho-Munata
 - b. Mesopotamia: Babylon
 - c. The influence of Mesopotamian earthen construction techniques in Iraq and Syria
 - d. Iran: Tchoga Zanbil and Bam citadel
 2. Earthen architecture in the Mediterranean region
 - a. The influence of Middle Eastern earthen construction techniques throughout the Mediterranean: Anatolia, Cyprus, Tesalia
 - b. The development of adobe construction from Greece to Italy and western Mediterranean regions
 - c. The origins of rammed earth in Northern Africa
 - d. The influence of the East on wood-frame earthen construction techniques
 3. Earthen architecture in Africa
 - a. Sub-Saharan living earthen cultures: Morocco (*kasbahs* and *ksars*) and Algeria
 - b. Outstanding samples of earthen architecture: Royal Palaces of Abomey in Benin, Tombouctou and Djene in Mali
 - c. The influence of Islam on earthen construction techniques
 - d. The transfer of technology between Spain and the Americas
 4. Earthen architecture in the Americas
 - a. Ancient civilizations: Moche, Chimu, Lambayeque, Sipán (Peru)
 - b. The influence of earthen construction techniques from ancient civilizations during Spanish colonial rule in the Americas
- Identification of major issues where earthen building traditions are still in use
 1. The living cities of Lima, Trujillo and Cusco, Peru
 2. The negative and positive effects of natural disasters on earthen construction
 3. The problematic use of concrete as an alternative material
 4. The case of urban settlements in Morocco and Mali
 5. The preservation of earthen building traditions as a method to preserve earthen buildings



SELECTED IMAGES

Arg-é Bam Citadel, Iran 2003, Photographer: Mary Hardy, ©J.Paul Getty Trust

Located in Bam, a city in the Kerman province of southeastern Iran, the Arg-é Bam Citadel was at one point the largest adobe building in the world. This enormous citadel on the Silk Road was built before 500 B.C.E and remained in use until its abandonment in C.E. 1850.. On December 26, 2003, the Citadel was almost completely destroyed by an earthquake, along with much of the rest of the modern city of Bam. After its 2004 inscription as a World Heritage Site, the Arg-é Bam, recognized for its unbaked mud brick and poured mud wall construction, was directly added to the World Heritage in Danger list.



Çatalhöyük, Turkey 2005, Photographer: Claudia Cancino, ©J.Paul Getty Trust

The Neolithic and Chalcolithic settlement of Çatalhöyük, located in southern Anatolia, was occupied from c. 7400-5200 B.C.E., and represents one of the largest and best preserved Neolithic sites found to date. Perhaps one of the earliest towns in the world, housing approximately 10,000 people, Çatalhöyük is famous for its sculpture, wall decorations, and unfired mud brick houses. Largely consisting of domestic buildings, the larger structures contain ornate wall paintings and the interiors of the houses were plastered.



Joya de Cerén, El Salvador 1999, Photographer: Francoise Descamps ©J.Paul Getty Trust

Joya de Cerén, a pre-Hispanic archaeological site in El Salvador, was declared a UNESCO World Heritage Site in 1993. Inhabited as early as 900 B.C.E, Joya de Cerén is the best preserved pre-Hispanic farming village in Latin America. Called the "Pompeii of the Americas", the village was buried by layers of volcanic ash from the erupting Laguna Caldera in approximately C.E. 600, leaving preserved adobe structures and evidence of daily life.



Huaca de la Luna, Trujillo, Perú 1998, Photographer: Claudia Cancino, ©J.Paul Getty Trust

Together with adjacent Huaca del Sol, the Huaca de la Luna compose the remains of a Moche center in northern Perú, on the western end of the Cerro Blanco. The Moche people are known for their monumental architecture, temples or *huacas*, and expert ceramics, metallurgy, and art. Of mud brick construction, Huaca de la Luna was occupied between C.E. 500- 900 and consists of three large platforms and plazas, undergoing at least six construction phases over 600 years. The huaca was intensely decorated with painted and sculptural reliefs, a few of which are still preserved.



Tschudi Palace, Ciudadela Chan-Chan, Trujillo Perú 2002, Photographer: Claudia Cancino, ©J.Paul Getty Trust

The Tschudi Palace is one of nine palaces of the city of Chan-Chan, the largest Pre-Columbian city in South America. A UNESCO World Heritage Site since 1986, the Chan-Chan Archaeological Zone covers an area of approximately 20 km², with a dense urban center of about 6km that archaeologists estimate might have held 30,000 people. This vast adobe city was built in approximately C.E. 850 by the Chimú, a civilization that grew out of the remnants of the Moche civilization. Chan-Chan served as the Chimú imperial capital until their conquest by the Inca in 1470.





Temple of Viracocha, Raqchi, Perú 2002, Photographer: Claudia Cancino ©J.Paul Getty Trust

The site of Raqchi is located 110 km south of the Inca capital of Cuzco. The most prominent structure at Raqchi and one of the most famous Inca structures is the mud brick Temple of Viracocha. A large rectangular hall, composed of a central adobe wall with a stone foundation, the temple is flanked on each side by a row of eleven columns. The interior surfaces appear to have been decorated and plastered. Both the foundation wall and the base of the columns exhibit classic high Inca stonework, while the remaining height is built of adobe. The temple is thought to be the largest roofed structure the Inca built.



Aït Benhaddou, Morocco 2005, Photographer: Claudia Cancino, ©J.Paul Getty Trust

The earthen town of Aït Benhaddou is located along the former caravan route between the Sahara and Marrakech in present-day southern Morocco. Aït Benhaddou displays a variety of pre-Saharan earthen construction techniques. An excellent example of the traditional pre-Saharan *ksar*, a group of earthen buildings, or *kasbas*, surrounded by defensive walls, Aït Benhaddou has been a UNESCO World Heritage Site since 1987.



Royal Palaces of Abomey, Benin 1996, Photographer: Leslie Rainer ©J.Paul Getty Trust

One of the most famous and historically significant traditional sites in West Africa, the royal palaces of Abomey in Benin are a group of earthen structures built by the Fon people between 1625 and 1900. A succession of twelve kings ruled the kingdom and each of them built a lavish palace on the royal grounds in Abomey, the capital city. Over the centuries, the palace complex came to be filled with earthen dwellings, murals, sculptures and intricate bas-reliefs. Earthen bas-reliefs were used as an essential decorative feature in the facades of most of the palaces. On January 21, 2009, there was a devastating fire that destroyed several buildings within the complex.



Sankore Mosque, Timbuktu, Mali 2008, Photographer: Leslie Rainer, ©J.Paul Getty Trust

The city of Timbuktu in Mali is home to the prestigious Sankore University and other madrasas, and the Sankore Mosque was an intellectual and spiritual center for the study of Islam throughout Africa in the 15th and 16th centuries. Thought to be the oldest of the city's three great mosques which exemplify Timbuktu's former grandeur, the mud brick Sankore Mosque, was restored by Imam Al Aqib between 157 and 1582. He had the sanctuary demolished and rebuilt it according to the measurements of the Kaaba at Mecca which he had taken with rope during his pilgrimage there.



Djenné Mosque, Mali 2008, Photographer: Leslie Rainer ©J.Paul Getty Trust

The city of Djenné in central Mali, known as the city of clay, is a historically and commercially important center of trade and learning. The city's Great Mosque, which sits in the large market square of Djenné, was rebuilt in its current incarnation in 1907. Famous for its earthen architecture, Djenné is one of the oldest known cities in sub-Saharan Africa and its historic city center was designated a World Heritage Site by UNESCO in 1988.



Hospicio Ruiz Dávila, Lima Historic Center, Perú 2002, Photographer: Claudia Cancino ©J.Paul Getty Trust

The Hospicio Ruiz Dávila (constructed from 1542-1674) was originally part of the monumental San Francisco Convent, considered by some to be the greatest architectural complex of its kind in Latin America, and declared a UNESCO World Heritage Site in 1988. Many of the buildings in the Convent were destroyed by a 1656 earthquake and were rebuilt utilizing local traditions. The building became a hospice in 1817 when Juan Ruiz Dávila purchased part of the San Francisco Convent to create a






retirement home for elderly women. The Hospicio has 79 small apartment units on two floors made of adobe and quincha.

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