

RAMMED-EARTH ARCHITECTURAL HERITAGE IN HAVANA, CUBA: PRESENT AND PERSPECTIVES

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Theme 2: World Heritage Earthen-Architectural Sites: Natural Disasters and Climate Change

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Earthen constructions were the predominant typology in Havana in the 16th century, composed of simple earthen walls (earth deposited within a framework of sticks) or rammed earth, sometimes stabilized with lime and covered with guano (palm leaves) or tiles. The five centuries, which have since elapsed, have minimized these typologies. Only inside the Historic Center of Old Havana, declared a World Heritage site, remain very old buildings with rammed-earth walls.

The effects of climate change have had an adverse effect on the architectural and urban heritage, and have impacted negatively earthen construction, which is extremely vulnerable because of its fragility to flooding, heavy rains and cyclonic winds (Casal, 2008). Moreover, given its small current representation in the city, these structures should be properly safeguarded. A study performed overlapped of the lowest-lying areas with different forecasts of weather events (tropical cyclones up to Force 5, combinations of extra tropical rainfalls and migratory anticyclones, cold fronts and the proper periphery of migratory anticyclones). This representation was intended to define the damage area of the urban fabric near the coastline, which included Port Avenue and the old harbor, emphasizing the possible impacts on heritage and historic architecture.

Conclusions and recommendations for further study are formulated, and additional preventive actions proposed, for diffusion among the community (Mitrani, 2006), in order to safely protect valuable heritage of the flood-zone area of the Historic Center.

1. INTRODUCTION

The Historic Center of Old Havana, declared as a World Heritage Site by UNESCO in 1982, is valued among the most precious urban complexes in Latin America and the Caribbean. This is due to the conservation of its urban fabric and variety of colonial and Republican architectural styles, including the original defense system of the city around the port. This shows the unmistakable imprint of stonemasons, responsible for the physical construction of a new world and a new culture involving Hispanics, Africans and Aborigines contributions. Havana, the meeting point of fleets from the Spanish colonial America, is possibly one of the cities where the most dissimilar cultures are represented. The Asian culture was also introduced in the 19th century.

The Historic Center has a great touristic and cultural attraction. It is a compulsory place for visitors to experience the city, including foreigners.

Earthen construction, which was widespread in Havana since the 16th century, declined as a constructive option in the 19th century. Structures were constructed of simple earthen walls (plastic earth deposited within a framework of sticks) or rammed earth in formwork, sometimes stabilized with lime. These were always roofed with guano (palm trees leaves) or terra-cotta tiles. The five centuries that have elapsed since

have reduced these structures to a minimum. Some very old rammed-earth buildings remain, often only the outer exterior walls, while the interior was modified with other constructive techniques. The rammed-earth walls were more vulnerable due to their fragility to flooding, heavy rains and cyclonic winds (Casal, 2008). Moreover, considering their current minimal representation in the area, adequate protection is required.



Fig.1 Waves on the Malecon of Havana (credits: Cuba Debate, 2008)

2. CLIMATE THREATS

The average increase of global temperatures is reflected by the increase in the average sea temperature in the Caribbean. In Havana, this change has enlarged and will further extend the frequency and intensity of floods by sea incursion, rain and cyclonic winds, all of which cause serious damage to heritage, especially rammed earth, due to destructive action of strong winds and humidity in different forms (environmental, infiltration, capillarity, and surface erosion) (CITMA, 2011).

A study on the increase in average sea level by the Weather Institute (INSMET) in 2009 estimated that sea-level rise could reach 27 cm in 2050 and 85 cm by the end of this century (1), although when combined with the action of a hurricane, this number could be much higher (CITMA, 2006, p. 2011). So, considering only the height of current waves, which produce light to moderate flooding, more intense and damaging floods are possible in the immediate area of the Malecón (waterfront). In the event of greater wave heights, flooding would logically be even more severe (2) (Mitrami, 2006).

The abrupt changes in moisture content and temperature cause cracks and could possibly lead to the collapse of these ancient structures. When periods of very heavy rains are followed by sunny and dry days, collapses increase in the city, with an average of more than one per day.

3. FLOODED AREA

The coastal area under study was heavily built-up. The immediate access to the channel of the bay, where several swamps were, was later filled in and urbanized. As an example, the current Cathedral Square was originally known as Plazuela de la Cienaga (Swamp Square).

A possible scenario of overlapping floods of lower areas generated by potential weather events (very heavy rains, tropical cyclones, extra tropical rainfalls and combinations of migratory anticyclones, cold fronts and the proper periphery of migratory anticyclones) is shown on the map of Fig.3. If there was a Force 5 hurricane, the combination of events would be the most unfavorable.

The critical flood zone (primary) coincides with the low areas near the initial development part of the city, close to the mouth of the channel that provided access to the bay. The wharfs of the first port are also included in this area. This zone represents very valuable urban fabric in its architectural, historical and heritage components. The outline of this primary urban sector provides an approximation of the original line coast.

To better understand these impact studies, more detailed topographical surveys of the critical area would be necessary. In order to safely identify these limits, specific modeling of the sea incursion on the inner shore of the bay needs to be performed. A review of existing drains to the coast is required, considering the increase in flow by heavy rains, combined with the possible incursion of the sea by an extreme northwester.



Fig.2 Inventory of wall types, and primary and secondary flooded areas in Old Havana; yellow circles reveal rammed-earth construction (credits: Rodriguez, 2011 - Plan Maestro de la oficina del Historiador de la Ciudad de la Habana, Dirección de Planificación Física Ciudad Habana y CITMA Ciudad Habana, 2006-2011)

4. HERITAGE VALUE

The most vulnerable area within the historic center is also one of the most sought after for tourism and with very high heritage significance. Here are found the Cathedral Square and San Francisco Square. In the secondary sector are located Armas Square and the axes of Mercaderes and Oficios Streets, presenting lower risks of flooding.

The Cathedral of Havana is valued as the best Cuban example of Baroque architecture, in addition to the buildings that outline it, which also hold great architectural and heritage value. Among them, only the Cathedral is placed on an over foundation, which in some ways protects it from lesser flooding. San Francisco Plaza is located opposite the quay for cruise ships, which makes it the maritime gateway to the city (3).

Naturally, the aim is not only to protect architecture, but all art objects, urban landscapes, and other elements of heritage significance in the urban area that must be preserved as well.

Nº	Address	Use	Flooding Risk	Heritage value
1	Peña Pobre, 64	Collective housing	High	Medium
2	Empedrado, 215	Building of the Alejo Carpentier Foundation	High	High
3	Cuba, 221	Collective housing	High	Medium
4	Obrapía, 158-160	Museum building	Medium	High
5	Oficios, 53	Hostel building	High	High
6	Lamparilla, 9	Bldg. in repair	Medium	Medium
7	Mercaderes, 257	Bldg. in repair	Medium	Medium
8	San Ignacio, 703	Individual housing	Medium	Medium
9	San Ignacio, 705	Individual housing	Medium	Medium
10	San Ignacio, 709	Carpentry Bldg	Medium	Medium

Table 1. Details of rammed-earth buildings in the flood area (credits: Raimundo de la Cruz, Plan Maestro de la oficina del Historiador de la Ciudad de la Habana, 2011)

5. RAMMED-EARTH CONSTRUCTION

Out of a total of 24 rammed-earth buildings identified around the town, ten of them or 40% of the total are located in the flood zone. Of these, four are located in the most vulnerable primary sector. In each case, research needs to occur, to review if there is lime stabilization, in order to pinpoint the most vulnerable buildings.

The Alejo Carpentier Foundation, originally the residence of the Countess of La Reunion, and the Valencia Hostal, a former residence of Count Casa Moré, is found in the primary flood zone and is of high heritage value. The Museum Obrapía House is equally important, but is located in the secondary sector. In this area, on the Puerto Avenue, the Russian Orthodox Cathedral was built using typical details of gold onion-shaped domes; it has become a new and controversial touristic curiosity.

Notes

- (1) According to the estimate by a team of oceanographers, sea-level rise would be 31.14 cm in 2050 and 84.92 cm in 2100.
- (2) According to estimates in 2050, 2,550 km² would be submerged throughout the Cuban archipelago; this area would reach 5,994 km2 in 2010, representing 2.32% and 5.4% of the land area, respectively.
- (3) Formerly the docking area for daily-service ferries to Florida, USA.

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AL-TURAIK DISTRICT OF AL-DIR’YAH, SAUDI ARABIA: WORLD HERITAGE SITE FACING PERIODIC EXTREME WEATHER EVENTS

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Abstract

Al-Turaif district of al-Dir’iyah in the Kingdom of Saudi Arabia on the outskirts of Riyadh was inscribed on the World Heritage List in 2010. Al-Turaif site covers approximately 29 hectares with a buffer zone of 238. Nominated under criteria iv, v and vi, the site is an outstanding example of a Najdi settlement, a significant human settlement in a desert environment intimately linked to the adjacent Wadi Hanifah (a dry riverbed), site of the first two Saud States, and connected to the teaching of the Islamic reformer who lived there, Sheikh Mohammad Bin Abdul Wahab.

Dating to the 15th century, the site was deliberately destroyed in 1819 by the Ottomans. As such its current state is that of a mud-brick ruin, extraordinarily evocative both for its size and detail, but also for the beauty of its setting within the Arabian plateau landscape. Located at the crest of the escarpment, the area receives very little annual rainfall. However, when there is precipitation, it typically arrives as violent rain events. There are also periodic sandstorms that “sand-blast” the structures. The site is extremely vulnerable to both of these phenomena, because of the steepness of the topography, the ephemeral nature of the construction material that requires cyclic renewal, and the incompleteness of the architecture, no longer being roofed or having the capacity to shed water.

This paper will describe the significance of the site, its physical nature, and the risks to its survival. It will propose environmental monitoring together with conservation measures that will improve risk preparedness and disaster response. Most of the conservation methods are specific to mud-brick ruins, but the paper will also include the proposed mobilization of civil society as a tool for use in risk preparedness and disaster response that is applicable to heritage sites in general.

1. INTRODUCTION

From 19-20 February 2011, the authors participated in a two-day workshop that included several international experts (1), representatives of the Saudi Commission for Tourism and Antiquities (SCTA) (2), and the Arriyadh Development Authority (ADA) (3). The purpose of the workshop was to review conditions and provide recommendations for the treatment of al-Turaif district (Fig. 1) at the site of al-Dir’iyah on the outskirts of Riyadh along the Wadi Hanifah, which was added to the World Heritage List in 2010.

2. BACKGROUND

2.1 Brief History

It is known that Wadi Hanifah has been inhabited for at least 80,000 years. Although no Neolithic sites have been found at al-Dir’iyah, it is likely they existed. It is also believed that by the 3rd millennium BCE, oasis farming developed in Wadi Hanifah.

Written sources attest to settlements in the Riyadh area during the Classical period of the Mediterranean (500 BCE).

In pre-Islamic times, the area around the Wadi was cultivated, and prospered until the decline of the Roman Empire, the advent of Christianity, and the lessening of the demand for incense. As settlements weakened, nomadic tribes rose to power. A centralized government appeared between the 5th and 6th centuries CE, but Christianity was defeated in 634 CE in a battle to the north of Wadi Hanifah.

The Umayyad Dynasty took control of the area in 692 CE. However, after the last Abbasid campaign in the 9th century, the area reverted to local rule. By the 10th century, the region became part of the route to Mecca. In the two succeeding centuries, the area was prosperous, eventually developing the Najd settlements in the 15th century, of which also dates the origins of al-Dir’iyah. In 1446, Ibn Dir’, the chief, invited his relatives from the Gulf Coast to inhabit the farmlands,