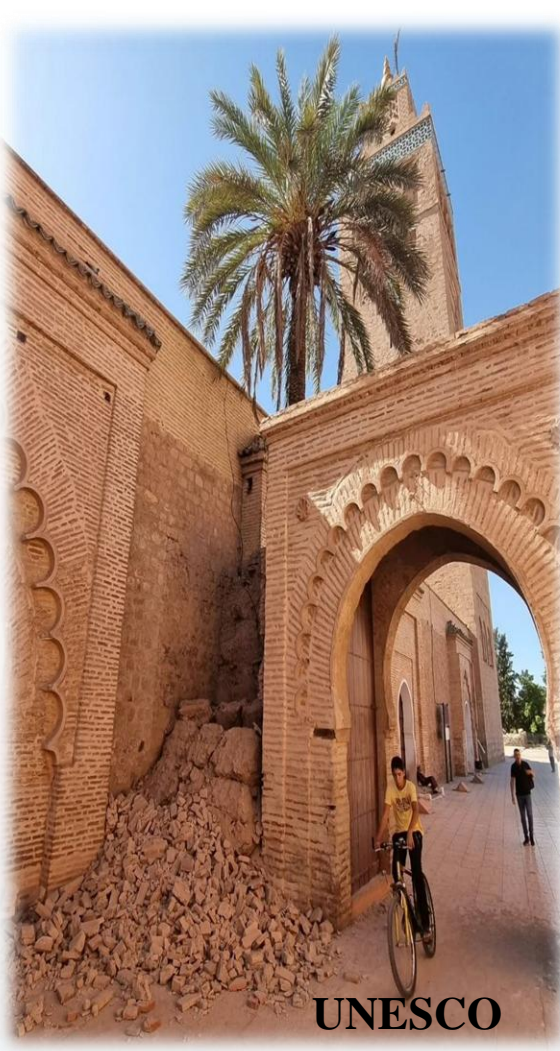


The built material architectural cultural heritage tested by the Al Haouz earthquake: Case of the Koutoubia Mosque in the city of Marrakech

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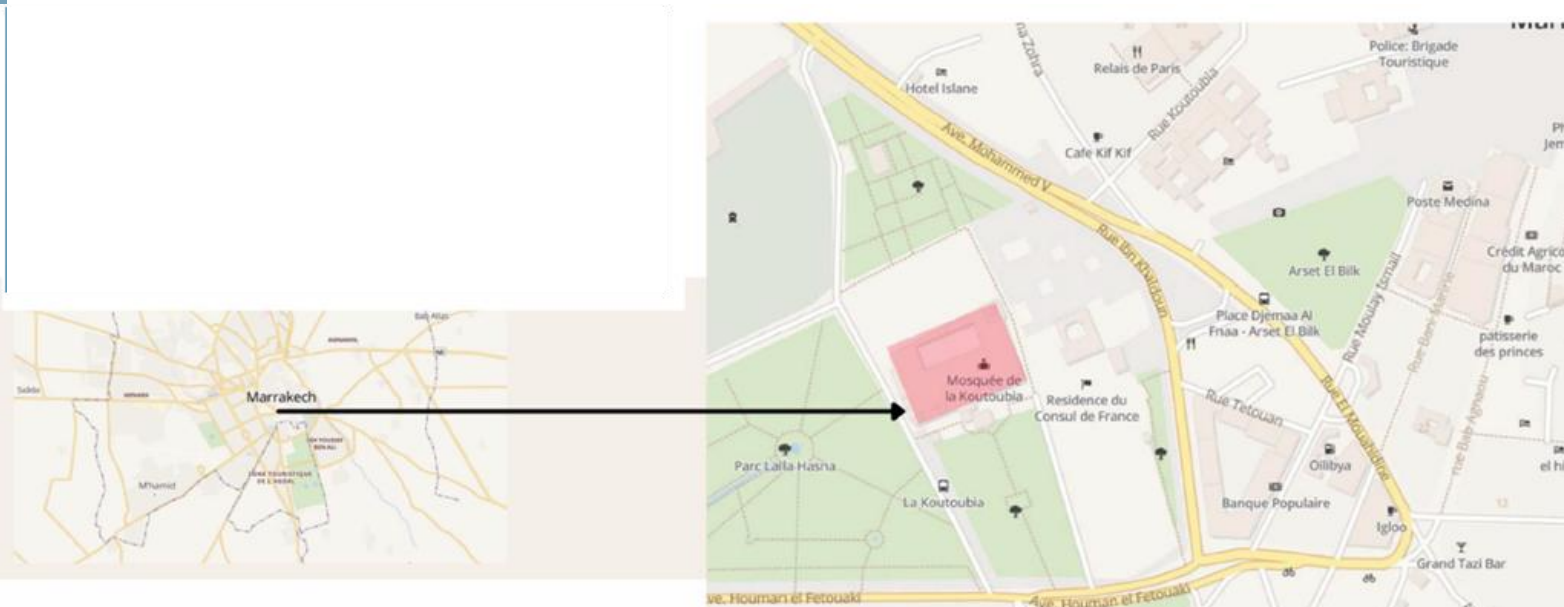
Abstract

What is more frightening than an unexpected earthquake in the middle of the night for people and for buildings and especially heritage buildings whose response to the earthquake is unknown. The country of Morocco, and more precisely the region of Al Haouz, more precisely the city of Marrakech named capital of culture of the Islamic world for the year 2024, by the Islamic World Educational, Scientific and Cultural Organization (ICESCO), experienced a serious earthquake of magnitude $M = 6.9$ on September 8, 2023 at 22:11:2.2 UTC (23:11 Local), the most serious earthquake in the history of the country according to seismic stations. The Koutoubia Mosque built in the 12th century was one monument among others that suffered this tremor. In this article we will describe the location, the construction technique and the materials used in this monument and we will also go through in a non-exhaustive manner the damage caused by this earthquake on the Koutoubia Mosque whose architecture is part of Almohad art.



Introduction

Considered by some as one of North Africa's most refined landmarks and frequently replicated for its aesthetic and architectural appeal, the Koutoubia Mosque stands out as a major emblematic tourist attraction in Marrakech. Its strategic location and striking appearance enhance its appeal, drawing both tourists and Muslim worshippers. The image of the Koutoubia often serves as the visual symbol of the city of Marrakech. In earlier times, as many as 100 booksellers used to trade at the mosque's entrance and in the surrounding gardens. Although these booksellers have since disappeared, the tradition lives on through local vendors who now sell small items, nuts, and popcorn. Especially at dusk, when locals gather under the orange trees, these merchants contribute to a vibrant and lively atmosphere. The mosque is known by various names, including Jami 'al-Kutubiyah, the Koutoubia Mosque, the Kutubiya Mosque, the Kutubiyyin Mosque, and the Booksellers' Mosque—each name reflecting its historical connection to the once-thriving book market that surrounded it. The Koutoubia Mosque is located in Marrakech, Morocco. Specifically, it is situated near the Jemaa el-Fna square, which is the main square and marketplace in the city.



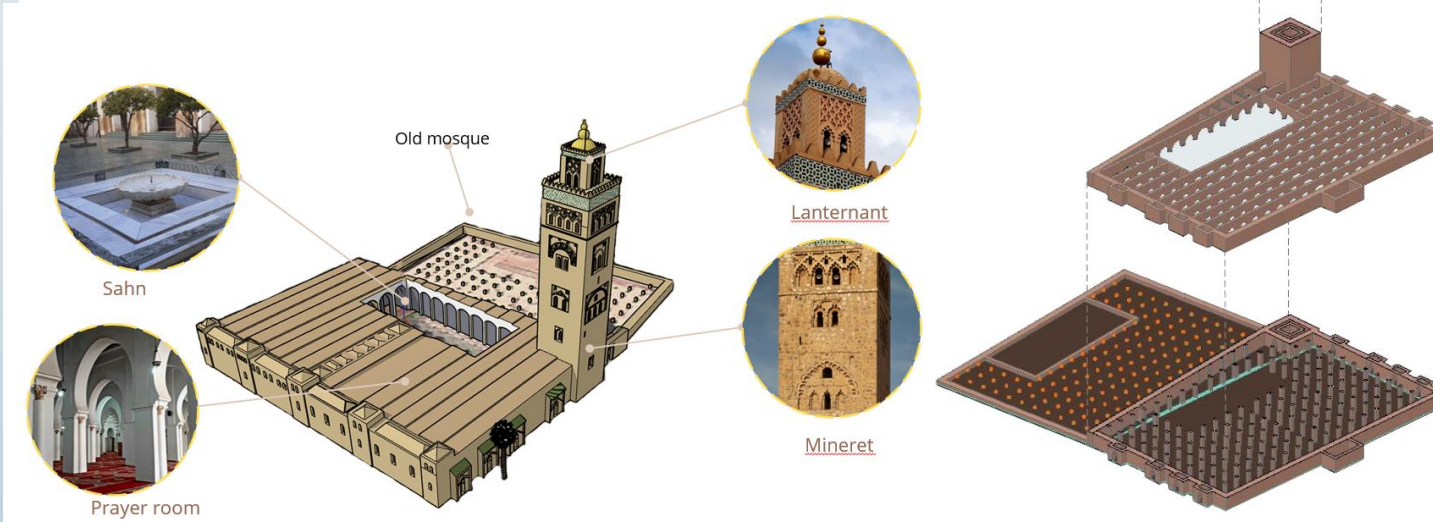
History of monument

Dominating the skyline of Marrakech and serving as a central landmark in the heart of the city, the Koutoubia Mosque, constructed during the 12th century by the Almohad dynasty, stands as a testament to the historical legacy of Morocco. Currently towering at 70 meters, its minaret retains the title of the tallest structure and the largest mosque in Marrakech. Adhering to local regulations, no new construction ventures are permitted to surpass the height of this iconic minaret. This not only preserves the historical significance of the mosque but also ensures that it continues to be a focal point for residents and visitors alike, offering a distinctive element in the city's architectural landscape.

The original construction of the mosque dates back to the Almoravid dynasty's era. However, when the Almohad dynasty assumed control, they reportedly demolished the mosque due to its improper alignment with Mecca. Subsequently, in 1158, the Almohads undertook the reconstruction of the mosque, shaping it into its present form. Notably, during this rebuilding phase, the Koutoubia minaret served as a model for the Hassan II Mosque in Casablanca and the Le Giralda in Seville, Spain, showcasing the influence of Moorish architecture as the Almohad empire expanded north into Andalusia. The Koutoubia Mosque stands as a splendid illustration of Moorish design, characterized by its distinctive keystone arches and intricate decorative stonework.

Building analysis

The mosque consists of ;

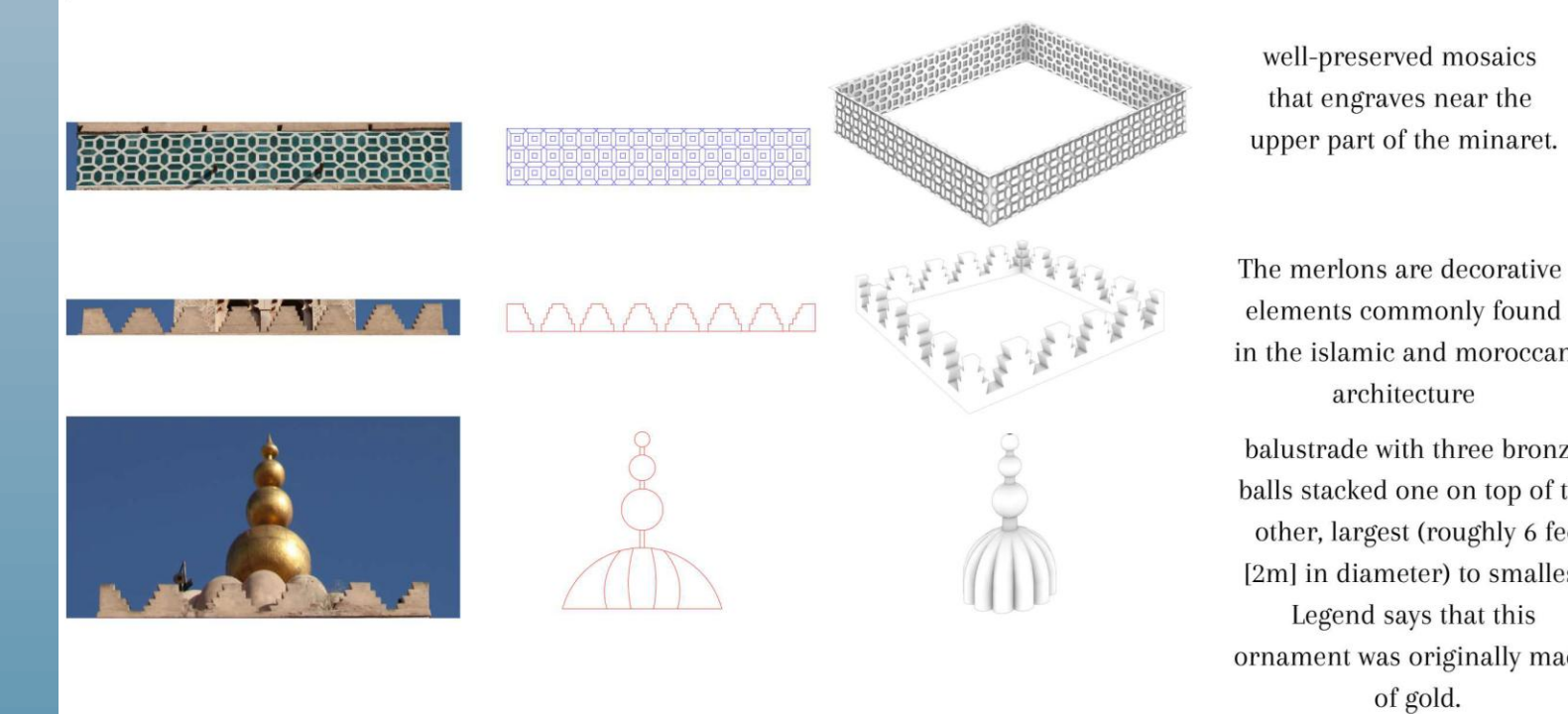
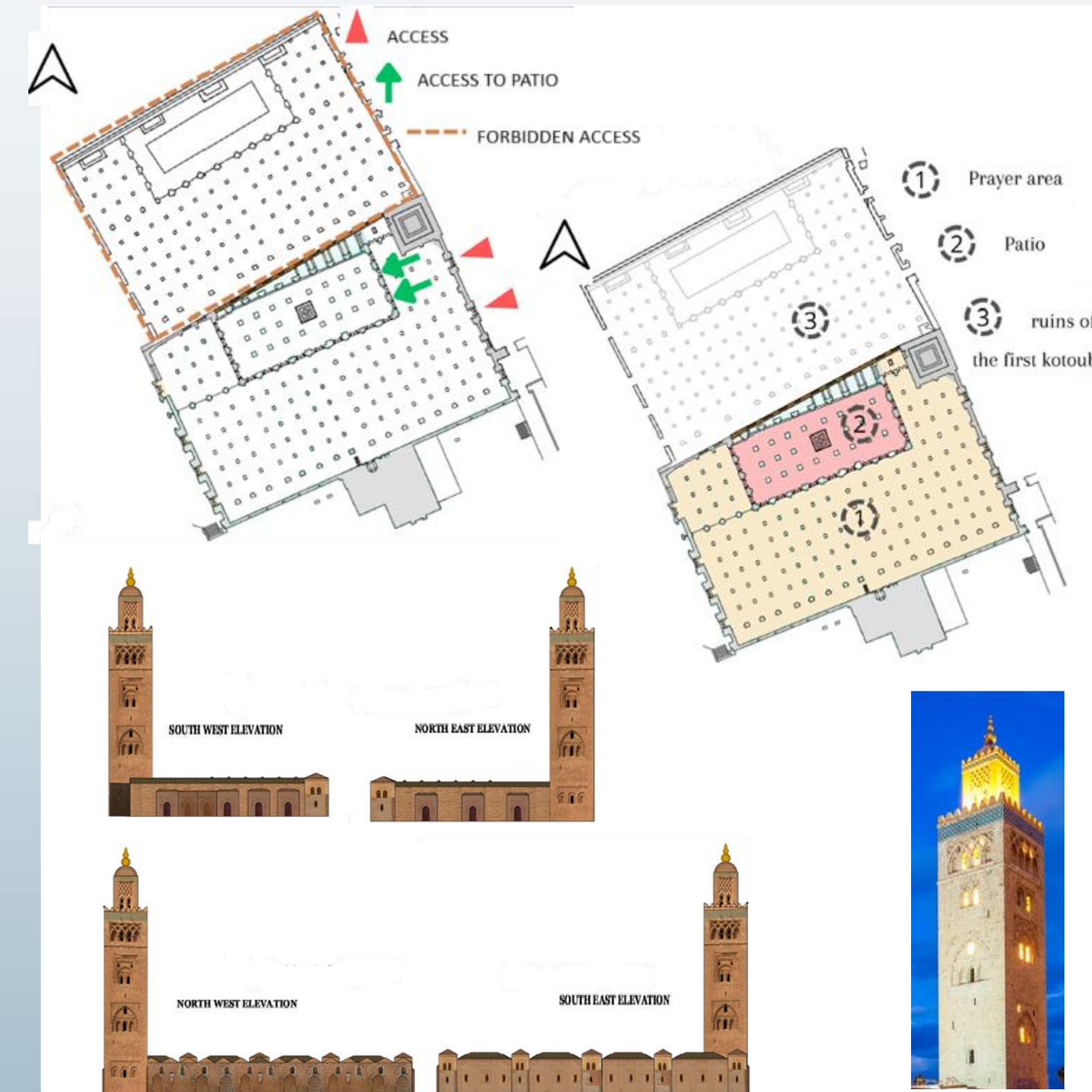


plan, sections and facade



The first kotoubia built in 1148 by the Almohades

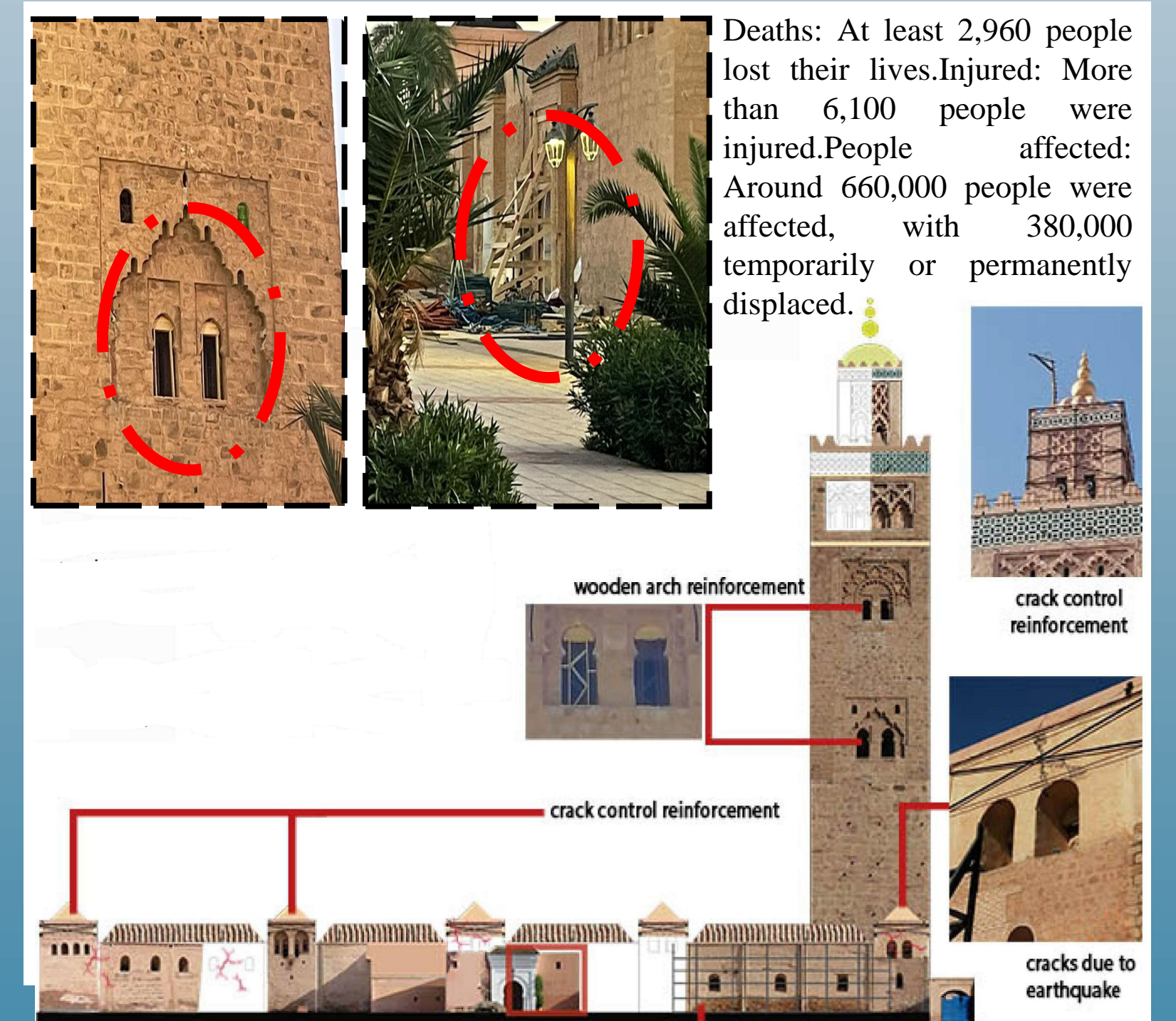
The second kotoubia built in 1158 by the Almohades



The load-bearing elements of mosques and their annexes are made of four basic materials: sandstone, tabiya clay, fired brick and wood.



After the Moroccan earthquake, the Koutoubia structure suffered considerable damage,



Conclusion

The use of sandstone reflects the traditional building techniques of the Almohad era, illustrating the skills and engineering knowledge of the builders of that period. As a local material, sandstone symbolizes the cultural and historical identity of Marrakech and its people. It bears witness to the use of local natural resources in monumental construction. In short, sandstone in the construction of the Koutoubia Mosque is not only a practical choice for its physical properties and durability, but also an aesthetic and cultural choice that contributes to the historical significance and iconic character of the mosque.