Luxor International Journal of Archaeological Studies
**PRINT-ISSN:** 2535-1788 / **ONLINE-ISSN:** 2974-4121
HTTPS://LIJAS.JOURNALS.EKB.EG/
Volume 7, Issue 2, December 2024: pp. 217-226

# Structural Safety in Egyptian National Project (Decent Life) To Confront Geotechnical Environmental Changes (Case study of the reconstruction of the Al-Ataween historical Mosque)

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**Abstract**

The Egyptian National Project "Decent Life" is a presidential initiative launched by President Abdel Fattah El-Sisi to develop the Egyptian countryside. Aligned with the Sustainable Development Goals (Egypt 2030), this initiative aims to rebuild and enhance buildings that do not meet environmental security standards, focusing on both construction fundamentals and the human dimension within society. A prime example is the Al-Atween Mosque, the oldest mosque in Al-Saha Al-Radwania area in Luxor Governorate. The presence of an ancient pulley system for drawing water from a groundwater reservoir prior to the arrival of fresh water highlights its historical significance. The study conducted includes an environmental assessment and geotechnical examination to identify and address deterioration manifestations such as floor, wall, and column deformations due to climatic factors like humidity, as well as corrosion in concrete and iron from structural defects such as soil replacement. Cracks are evaluated using the Saudi expert system to identify their types, causes, and treatment methods. The goal is to ensure structural safety for sustainable building construction as advocated by the Decent Life Initiative, encompassing reinforcement operations in accordance with the Egyptian code, increasing the depth of the replacement layer, effective insulation of foundations, and reinforcement with stones and marble.

**Keywords**

Decent Life; Structural safety; geotechnical; environmental; change.

**Article History**

Received: 23/9/2024

Accepted: 28/11/2024

DOI: 10.21608/lijas.2024.320623.1046

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# السلامة الإنشائية في المشروع القومي المصري (حياة كريمة) لمواجهة التغيرات البيئية الجيوتقنية (دراسة حالة إعادة إعمار مسجد العطاوين التاريخي)

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**الملخص**

المشروع القومي المصري "حياة كريمة" هو مبادرة رئاسية أطلقها الرئيس عبد الفتاح السيسي لتطوير الريف المصري. تتماشى هذه المبادرة مع أهداف التنمية المستدامة (رؤية مصر ٢٠٣٠)، وتهدف إلى إعادة بناء وتحسين المباني التي لا تفي بمعايير الأمن البيئي، مع التركيز على أسس البناء والبعد الإنساني في المجتمع. مثال بارز على ذلك هو مسجد العطاوين، أقدم مسجد في منطقة الساحة الرضوانية بمحافظة الأقصر. يعد وجود نظام بكرة قديم لسحب المياه من الخزان الجوفي قبل وصول المياه العذبة دليلاً هاماً على قِدم هذا المسجد. تتضمن الدراسة التي تم إجراؤها تقييماً بيئياً وفحصاً جيولوجياً لتحديد ومعالجة مظاهر التدهور مثل تشوه الأرضيات والجدران والأعمدة نتيجة لعوامل المناخ مثل الرطوبة، وكذلك تآكل الخرسانة والحديد نتيجة للعيوب الهيكلية مثل استبدال تربة الأساسات. يتم تقييم الشقوق باستخدام النظام الخبير السعودي لتحديد أنواع الشقوق وأسبابها وطرق علاجها. الهدف هو ضمان السلامة الهيكلية لبناء مستدام للمباني كما هو منصوص عليه في مبادرة حياة كريمة، بما في ذلك عمليات التقوية وفقًا للكود المصري، وزيادة عمق طبقة الاستبدال، والعزل الجيد للأساسات، والتقوية بالحجارة والرخام.

**الكلمات الدالة**

حياة كريمة؛ السلامة الإنشائية؛ الجيوتقنية؛ التغيرات البيئية.

## Introduction

The initiative launched by President Abdel Fattah El-Sisi on January 2, 2019, aims to significantly improve the standard of living for the neediest segments of society at the state level throughout 2019. It also seeks to enhance the quality of daily services provided to these groups, particularly in rural villages. The initiative's primary goal is to provide a decent life for the most vulnerable groups across the Republic, ensuring they have access to essential services and opportunities. A key component of the initiative is the health care department, which provides medical services, surgeries, and prosthetic devices to those in need. Additionally, the initiative focuses on developing the poorest villages according to the poverty map, aligning with the broader development plan "Egypt 2030." This includes creating job opportunities in small projects to boost local economies and improve living conditions. The initiative also aims to provide people with comfort in healthy homes and places of worship, contributing to the structural safety of public buildings. By addressing these various aspects, the initiative strives to create a more equitable and prosperous society, where every citizen has the opportunity to live a dignified life.

The importance of structural safety of places of worship is a key development goal in Egypt, reflecting the nation's commitment to preserving its rich cultural and religious heritage. Ensuring the structural integrity of these sacred sites is crucial for several reasons:

- Cultural and Historical Preservation: Places of worship in Egypt, ranging from ancient temples to medieval mosques and churches, are not just religious sites but also historical landmarks that chronicle the country's vast history. Preserving their structural safety helps maintain the continuity of cultural practices and traditions, ensuring that these sites remain as testaments to Egypt’s diverse religious heritage.
- Community Safety and Social Stability: Places of worship often serve as community centers where people gather not only for worship but also for education, social services, and community events. Ensuring the structural safety of these buildings is paramount to protect the lives of those who use these spaces regularly. Safe and secure places of worship promote social stability and cohesion, providing a safe haven for spiritual and communal activities.
- Economic Impact and Tourism: Egypt’s historical and religious sites are major attractions for tourists from around the globe. Maintaining the structural safety of these places helps sustain tourism, which is a significant contributor to the national economy. Well-preserved sites attract more visitors, generating income that can be reinvested in further conservation efforts and boosting local economies.
- Mitigating Environmental Risks: The structural safety of places of worship is increasingly important in the face of environmental challenges such as climate change, extreme weather events, and urbanization. Ensuring that these buildings can withstand environmental stresses protects them from damage due to natural disasters or gradual environmental degradation. Implementing advanced engineering solutions and regular maintenance routines can mitigate these risks, preserving the integrity of these structures.
- National Identity and Pride: Places of worship are symbols of national identity and pride, embodying the spiritual and cultural values of the community. Their preservation is crucial for maintaining the historical narrative and fostering a sense of pride and continuity among citizens. Ensuring the structural safety of these sites honors the legacy of the past and inspires future generations to value and protect their heritage.

- Educational and Research Opportunities: Well-preserved places of worship offer valuable opportunities for education and research. They serve as living laboratories where historians, archaeologists, and engineers can study ancient construction techniques and cultural practices. Protecting these sites allows for ongoing scholarly work that can contribute to our understanding of historical and architectural advancements.

By prioritizing the structural safety of places of worship, Egypt aims to safeguard its cultural heritage, protect its citizens, and support its economy. This initiative is part of a broader effort to preserve the nation's rich history and promote sustainable development. Implementing advanced protective measures and fostering a culture of preservation will help maintain these significant sites for future generations, ensuring their continued relevance and accessibility.

Al-Ataween Mosque is one of the old mosques in the village of Al-Baghdadi, south of Luxor. The Grand Mosque is also considered one of the Qur'an schools (Sheikh Hamed Jibal School for the Sciences of the Noble Qur'an and the School of Sheikh Ahmed Radwan for the Sciences of the Holy Qur'an and the Sunnah of the Prophet). The mosque is about 5 km southeast of Luxor. The worshipers of the mosque inherited the shop from their fathers and grandfathers, but they do not have conclusive evidence of the date of the first construction of the mosque. However, there are different cultural and material evidence about the age of the mosque, such as the cultural heritage (1) the presence of ancient families in the region, (2) Sheikh Abdel Halim Mahmoud (Sheikh of Al-Azhar Al-Sharif 1973: 1978 AD). Performed Friday prayers in the mosque on Friday, October 5, 1973 AD. Blessed be in the presence of Sheikh Ahmed Radwan, Sheikh Hamed Jibal, Sheikh Muhammad Abdullah, and the presence of leaders from the Egyptian Armed Forces. As for the physical evidence, it includes: (a) the deterioration of the building. (B) The presence of layers for restoration. (C) The presence of a bucket to raise water from the old well, even though no one from the current generation has lived with the water entering the village, Figure 1 shows bucket of Al-Ataween mosque.

*Fig. 1. bucket to raise water from the old well*

This study aims to Multidisciplinary risk-based analysis that led to the deterioration of the condition of Al-Ataween Mosque, and therefore it was nominated in the list of mosques to be replaced within the Decent Life Project. (1), (2), (3) The study will also clarify the strategy of analysis as the SOBANE strategy, and An Expert System for Diagnosing Common Cracks in Concrete Buildings in Saudi Arabia to classify of factors that led to the degradation, such as (a) environmental damage factors, (b) geotechnical and structural factors, And an evaluation of the foundations of structural safety when rebuilding. (4), (5), (6), (7).

**Study area:**

The mosque area "Al-Saha Al-Radwaniya " in the urban extension of the cities of Al-Bayadeya and Luxor, the location of “Ataween mosque” is 25.38.10.3N 32.37.28.1E at about 5km northern east of Luxor city. Figure 2. illustrate the location map and figure 3. shows picture by google earth.

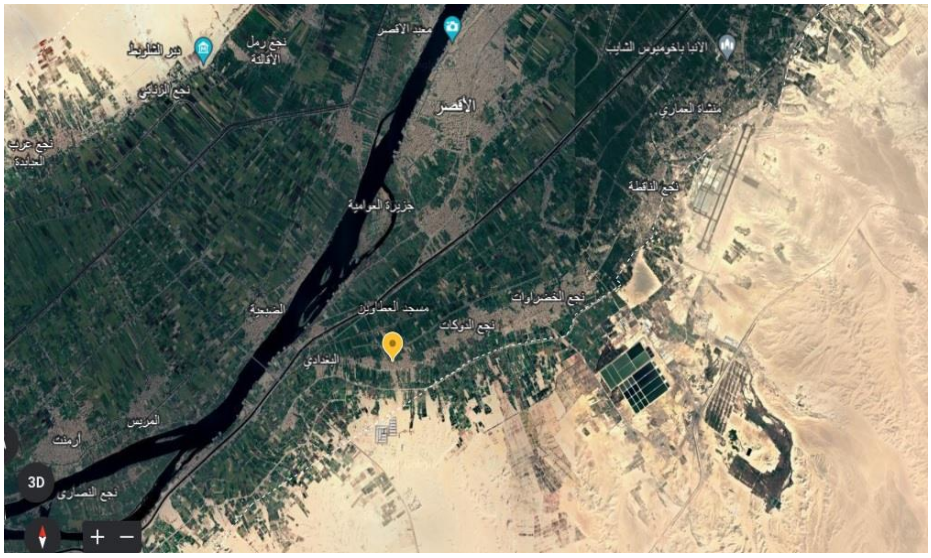


*Fig. 2. the location map from google earth.*


*Fig. 3. picture of Ataween Mosque by google earth.*

**Deterioration forms:**

Table 1. shows forms of damage at the mosque varied between the foliation and the falling of layers of plaster and colors from the walls, the appearance of salts, small and large cracks, damage to the marble, rusting of the reinforcing iron, and a clear subsidence in the mosque’s columns. (8), (9), (10), (11),

*Table 1. forms of damage at the mosque*

| | |
|---|---|
| The appearance of salts, small and large cracks, damage to the marble |  |
| The foliation and the falling of layers of plaster and colors from the walls |  |
| Subsidence in the mosque's columns |  |
| Rusting of the reinforcing iron |  |

**Deterioration factors:**

The foundation soil in the study area is made up of recent Nile sediments, so this is a major factor in the deterioration of the mosque, in addition to other environmental factors such as the high level of groundwater, (12), (13), (14), (15), the lack of application of insulation technology, and the poor quality of building materials. Many restoration and geotechnical scientists have described these factors. (16), (17), (18).

**Rebuilding process:**

The reconstruction process was supervised by the Engineering Department of the Luxor Endowments Directorate, which was concerned with taking the necessary measures to address the recurrence of damage resulting from geological processes in the historic mosque building, and ensuring structural safety, which is followed up by the Decent Life Program Administration. The construction was carried out on the same area of the mosque, 225 square meters, with an increase in the depth of replacement from 120 cm to 220 cm, with a quantity of 300 cubic meters, with compaction operations for all layers, after the process of isolating the foundations and bases with no less than 400 meters of bitumen. As for the reinforcement process, it was carried out according to the Egyptian code with 10 tons of high-quality reinforcing steel for the foundations, and to overcome the geological factors, in addition to isolating the foundations, they were raised from the ground by about 120 cm, in addition to the depth of the foundations, they were also insulated with bitumen. (19), (20), (21). Figures 4. A, B shows raised from the ground by about 120 cm, with the walls reinforced with stones. Figure 5 shows Marble reinforcement of walls after reinforcement and insulation operations with raising the level of the foundations.

*Figures 4. A, B raised from the ground by about 120 cm, with reinforced with stones.*

*Figure 5; Marble reinforcement of walls after reinforcement and insulation operations with raising the level of the foundations.*

**Discussion:**

The initiative launched by President Abdel Fattah El-Sisi on January 2, 2019, aims to significantly improve the standard of living for the neediest segments of society, particularly in rural villages. The primary goal is to provide a decent life for vulnerable groups across Egypt, ensuring they have access to essential services and opportunities. Key components of the initiative include health care services, job creation in small projects to boost local economies, and improving living conditions. By focusing on providing comfort in healthy homes and places of worship, the initiative addresses the structural safety of public buildings. Ensuring the structural integrity of places of worship is crucial for cultural and historical preservation, community safety, economic impact through tourism, and mitigating environmental risks. These sites are symbols of national pride and identity, serving as community centers and educational resources. The Al-Ataween Mosque, an old mosque in the village of Al-Baghdadi, south of Luxor, is a prime example, facing significant structural deterioration due to environmental factors. The study aims to conduct a multidisciplinary risk-based analysis of the mosque's condition, using strategies like the SOBANE strategy and an expert system for diagnosing common cracks in concrete buildings. The reconstruction process, supervised by the Luxor Endowments Directorate, involves increasing the depth of the foundation replacement, insulation with bitumen, and reinforcing walls with stones and marble. These efforts are part of the broader Decent Life Project, which aligns with Egypt's 2030 development plan to create a more equitable and prosperous society where every citizen has the opportunity to live a dignified life.

**Conclusion:**

The Egyptian National Project (Decent Life) is a presidential initiative launched by President Mohamed Abdel Fattah El-Sisi, President of the Arab Republic of Egypt, to develop the Egyptian countryside. The Decent Life Initiative is in line with achieving the Sustainable Development Goals (Egypt 2030). Its goals include rebuilding buildings that do not achieve environmental security and achieve the foundations of construction and the human dimension in society, including the Al-Atween Mosque, the oldest mosque in the Al-Saha Al-Radwan area in Luxor Governorate, achieving the appropriate structural safety for sustainable construction of buildings adopted by the Decent Life Initiative to replace them, including reinforcement operations according to the Egyptian code, increasing the depth of the replacement layer, good insulation of the foundations, and reinforcement with stones and marble.

**Recommendation:**

To effectively address the weathering and degradation risks associated with the Nubian sandstone roofs of buildings in Medinat Habu, it is recommended to implement innovative preservation strategies that take into account the impacts of climate change, particularly increased rainfall. These strategies could include installing advanced drainage systems to redirect rainwater away from the stone surfaces and the application of nanotechnology-based sealants that provide a breathable yet water-resistant barrier. Additionally, creating green roofs with vegetation that can absorb excess rainwater and provide natural insulation can be beneficial. Regular structural assessments and maintenance schedules are essential to monitor the stone's condition and promptly address any emerging issues. Collaboration with conservation experts and the integration of traditional knowledge with modern technology will ensure the long-term preservation and resilience of these historic structures.

**Acknowledgement**

I extend my sincere thanks to the Engineering Department of the Luxor Endowments Directorate for the cooperation

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