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Sustainable Development of High-Rise Residential Architecture from 1970-2014: Dubai Case Study on Modern Heritage

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Abstract

The Government of Dubai implemented Green Building Regulations & Specifications & Specifications (GBRS). In March 2014, Dubai has more than 1000 high-rise buildings in which more than 2 million residents are accommodated. However, 62% of the existing residential high-rise buildings dating from 1970-2014 do not meet the requirements of the new GBRS. The paper suggests a sustainability plan framework for the modern heritage buildings in Dubai that satisfies the new building regulations. This will require the development of a new set of tools to adequately protect and keep the identity and heritage of the existing buildings instead of replacing them with new ones. In this context, several case studies are presented, analyzed and discussed to present the potential and the challenges of keeping these buildings. Many of the existing buildings built in the City of Dubai from 1970-2014 are part of the memory of the place and contribute to the story of Dubai's development in the recent past. This research aims at protecting and documenting an important phase of the history of the urban development in the City of Dubai, highlighting the time period in which the initial principles that govern and guide the development of the city were developed. As part of Dubai modern heritage, the buildings under study have had a major impact on shaping the urban environment and crystallizing the architectural character of Dubai's development in the 1970s and 1980s. Besides that, the headlong modernization of Dubai will eliminate all evidence of the city's evolution. As a result, retrofitting of existing buildings should not only improve energy efficiency and performance but also keep the identity and heritage of the City of Dubai instead of replacing buildings with new ones.

Keywords

Modern Heritage, Sustainability, High-rise Buildings, Dubai, Green Building

1 INTRODUCTION

The United Arab Emirates (UAE) is situated in the Middle East, bordering the Gulf of Oman and the Arabian Gulf, between Oman and Saudi Arabia as shown in Fig. 1 (National Media Council, 2016). UAE is a federation of seven emirates. The UAE country covers an area of 83,600 km² and has a population of 9.543 million with a GDP of 348.7 billion USD.

The climate of the UAE is subtropical-arid with extremely hot and humid summers and warm winters according to the Köppen Climate Classification System (Koeppen, 2020), (Ministry of Energy, 2006). The hottest months are July and August when average maximum temperatures reach above 45 °C.

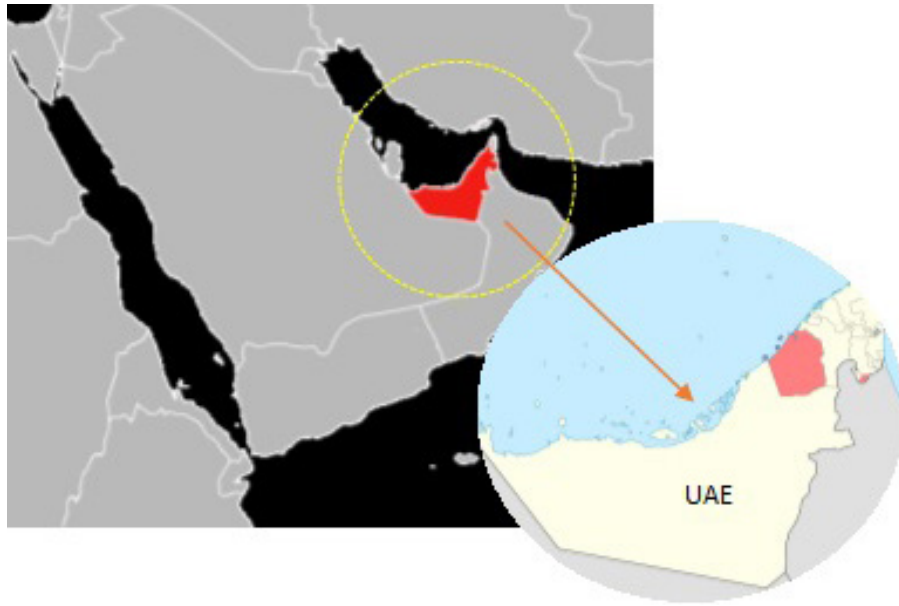


FIG. 1 UAE map and location. Source: (World Bank)

The UAE witnessed a sharp increase in population starting from 2005. The population increased from 2.449 million in 1995 to 9.154 million in 2015 as shown in Fig. 2. As an inevitable result of population growth in Dubai, high-rise residential buildings have become a prevalent solution. The high-rise building is considered an economic phenomenon in which business was the engine that drove the innovation of modern building technology. in the UAE and worldwide. Starting again from 2013 a sharp increase in the number of high-rise buildings was observed.

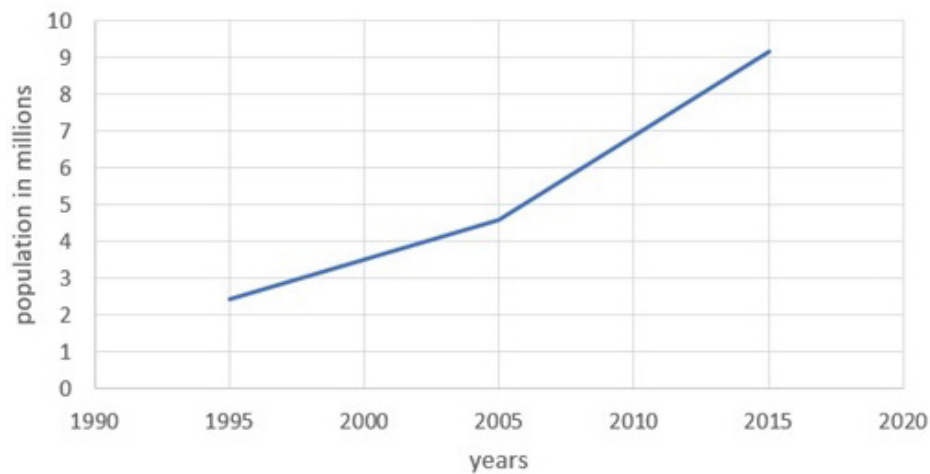


FIG. 2 UAE population, 1995-2015. Source: (Author, Based on World Bank)

This affected directly the construction sector in the UAE and resulted in additional strain on existing infrastructure and housing. New projects in these sectors were initiated to accommodate this growth and alleviate the associated pressure. Consequently, high-density residential structures experienced strong demand. Fig. 3 shows the number of high-rise residential buildings in Dubai from 1979 till 2018. It shows that starting from 2004, Dubai witnessed an increase in the residential high-rise buildings till 2007 where the number starts to decrease. This is attributed to the economic situation

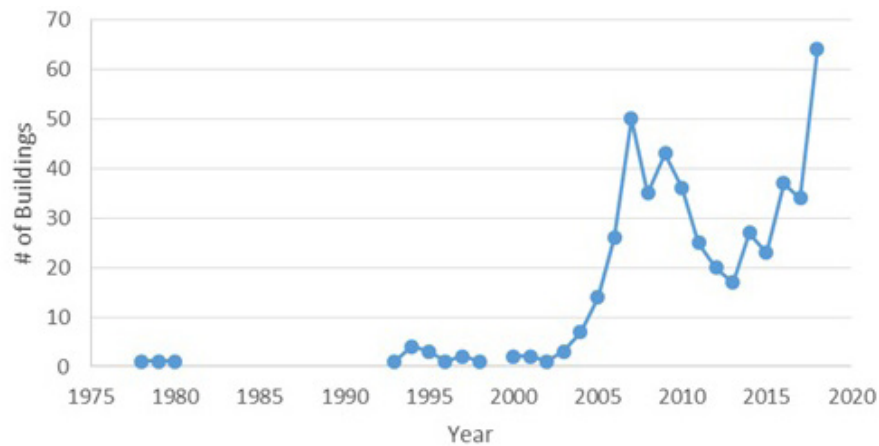


FIG. 3 Number of residential high-rise buildings in Dubai, 1979-2018. Source: (Author)

A clearer picture of the increase of residential high-rise buildings in Dubai is shown in Fig. 4 which represents the cumulative percentage of residential high-rise buildings in Dubai.

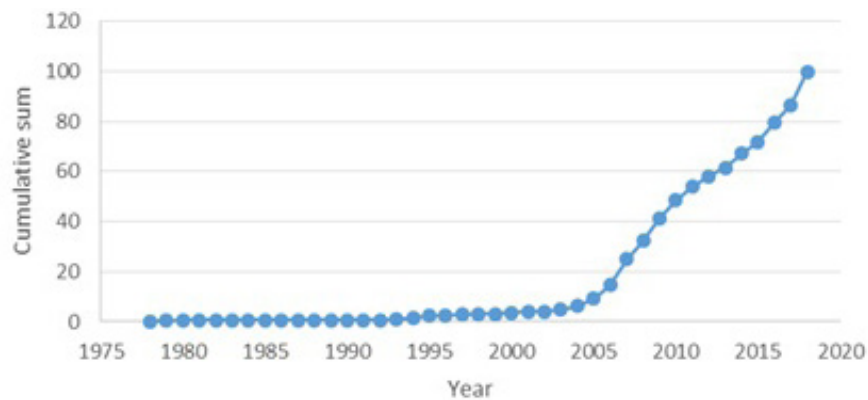


FIG. 4 Cumulative percentage of high-rise buildings in Dubai. Source: (Author)

On this basis, this work seeks to study the impact of high-rise buildings on the built heritage environment in Dubai which is the second largest but most densely populated of the seven emirates. For decades, modern architecture in the Gulf has been equated to the demolition of the traditional medina, with top-down plans and the gradual westernization of the country. Only recently, the Dubai government agenda has put the word 'heritage' in direct association with the architectural production of the modernization era after 1970 and the movement towards the preservation of the recent physical past (Al Qassemi & Fabbri, 2019).

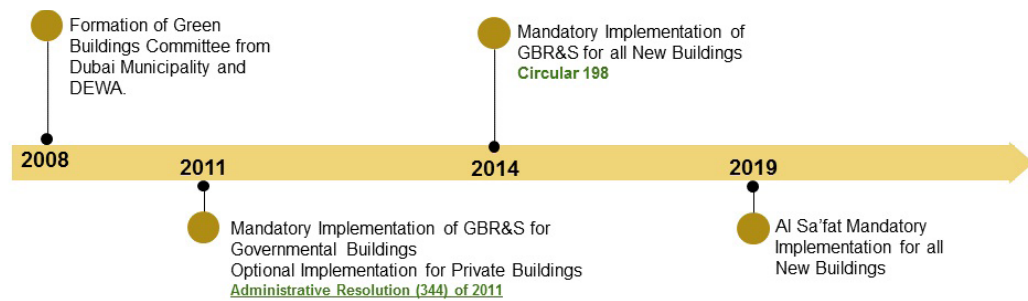


FIG. 5 Dubai green building roadmap. Source: (Dubai Municipality)

The focus of this research will be on high-rise buildings in Dubai from the 1970s until 2014, the year of the implementation of the GBRS in Dubai to document these buildings and protect them from blurring their identity. Dubai's modern heritage is of great importance as it contributes to the identity of the city, the collective memory and is part of the history.

Starting from 2008, Dubai government initiated a roadmap for green buildings as shown in Fig. 5. The implementation of GBRS and standards are mandatory starting from 2011 for governmental buildings. For private buildings, GBRS and standards are mandatory starting from 2014. In 2019, more restrict regulations called Al Sa'fat will replace the GBRS and standards.

Applying energy improvement measures adopted by Dubai government may destroy the historical and architectural values of existing buildings. This work contributes to enhancing the sustainability of the high-rise buildings, considering different aspects as formulated in the Sustainable Developments Goals (SDGs). Retrofitting existing buildings to improve sustainability and building performance helps in keeping the city's identity and heritage instead of removing existing buildings and replacing them with new ones. Several case studies will be presented and discussed in this work.

2 DUBAI MASTER PLAN

In 1960, John Harris developed Dubai's first master plan for Shiekh Rashid bin Saeed Al Maktoum (the father of modern Dubai) as shown in Fig. 6. He updated the master plan in 1971 as shown in Fig. 7. In his work, Harris understood the context and responded to the cultural and climatic conditions in Dubai (Al Rustamani, 2014).

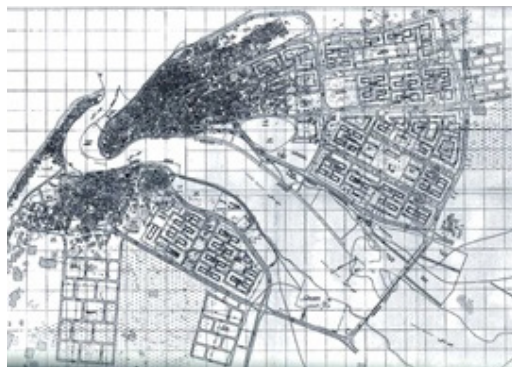


FIG. 6 John Harris's First Dubai Master Plan 1960.
Source: (Chapman, 2014)



FIG. 7 John Harris's Dubai Master Plan 1971.
Source: (Dubai Municipality)

Modern Dubai is shown in Fig. 8 with hotspots on three areas: World Trade Centre, Sheikh Zayed Road, and Dubai Marina. While the first two spots host some of the oldest high-rise buildings in WDubai, Dubai Marina has the largest number of high-rise residential buildings in Dubai. The World Trade Centre was the tallest building in the region when erected in 1979. Dubai's World Trade Centre which is originally called Sheikh Rashid Tower is the work of John Harris. It is picturesque among the newer high-rises of glass.

Along Sheikh Zayed Road some of the oldest residential high-rise building in Dubai can be found, among them the Toyota Building, considered as a landmark representative for the first generation of high-rise buildings. From east to west, existing buildings along the Sheikh Zayed Road are demolished to be replaced by a new generation of super-tall skyscrapers.



FIG. 8 Dubai Spot Light Areas, Source: ReDubai

3 DUBAI MODERN HERITAGE

Many of the buildings that were built in the 1960s and 1970s continue to occupy major places and perform important functions. These buildings influenced the urban environment and crystallized the architectural character of Dubai's growth in that time period. They are part of the memory of the place and contribute to the development story of Dubai. The 1960s and 1970s buildings are characterized by having concrete facades, small windows, external AC units and many of them balconies.

Fig. 9 shows a few modern heritage buildings that should be protected because they represent typical architectural and technical features of their time and because the majority of what was built in the 1960s-1970s and before has been demolished. Next to residential buildings many hotels and hospitals were built during that period.



FIG. 9 Examples of modern buildings in Dubai from the period (1960s-1970s).

Source: (Several Internet Sites)

3.1 NASSER RASHID LOOTAH BUILDING - 1974 / TOYOTA BUILDING

The Nasser Rashid Lootah Building on Sheikh Zayed Road (known as Toyota Building) is Dubai's oldest high-rise residential building and is considered a landmark symbol of high rise buildings of the first generation. In the 1970s, the building was surrounded by sand and scattered dwellings. Slowly, hundreds of skyscrapers sprang up around it as shown in Fig. 10. The building is reflective of its time, built with small windows and concrete facades to conquer the heat. The building is characterized by the number of external air conditioning units on many of the balconies. The building is a massive concrete block, often made of prefabricated elements with the typical architectural design of that period. It forms part of Dubai's visual heritage and its history and development because it is known by many peoples and has created some public awareness.

Despite that if this building is demolished it would be a big loss, strong indications that this building will be removed are beginning to appear. After more than forty years, the Toyota sign (it is so famous that even the building is named after it) on top of Nasser Rashid Lootah Building on Sheikh Zayed Road has come down.



FIG. 10 Toyota Building in Shaikh Zayed Road – 1974 and 2018 (top), and facade details (bottom).
Source: (8, Author)

3.2 DUBAI WORLD TRADE CENTRE (DWTC) - 1979 / SHEIKH RASHID TOWER

DWTC (originally called Sheikh Rashid Tower) shown in Fig. 11 was the highest building in the UAE when it opened in 1979. Currently, it is not among the top 100 tallest completed towers in the UAE. It is a 39-storey office tower and included exhibition spaces, restaurants, and a Hilton hotel when it was built. The Hilton was demolished in 2005. Over the years, more conference halls have been added and now the site is an important exhibition center.

Similar to the Toyota Building the tower is surrounded by newer glass skyscrapers. The tower is built from concrete with dominant horizontal structure while the windows are set back to avoid exposure to the harsh sunlight. The architecture integrates some typical local motifs including the use of arches on the exterior of the building. The tower appears on the back of the Dh100 banknote because of its value.

In 2018, Dubai Municipality has announced that the World Trade Centre tower will be preserved as part of the city's cultural heritage (Ahad, 2018).



FIG. 11 DWTC in Shaikh Zayed Road – 1979-2016. Source: (The Storypedia, 2018)

3.3 DEMOLISHING MODERN HERITAGE

Several modern heritage buildings were demolished or damaged recently for different reasons. For example, Sheikh Rashid Building which was constructed in 1970 was damaged partially due to fire in 2019. The historic Ramada Hotel in Bur Dubai, one of the city's oldest hotels, was closed to clear the area for a new mixed-use project in August 2016. The hotel is considered another link to early Dubai Modern Heritage. The hotel which was built in 1983 is located in a rapidly growing area where a new block of apartments or hotels or skyscrapers is added every day. Unfortunately, the hotel was demolished in 2017 as shown in Fig. 12.



FIG. 12 1983 - Ramada Hotel / Bur Dubai, Demolished in 2017. Source: (The National, 2016)

4 METHODOLOGY AND ANALYSIS

Based on the previous analysis and realizing that some of Dubai's modern heritage architecture has been lost, a preservation strategy that complies with the green building legislation and the current sustainability frameworks and that protects the old buildings from being demolished must be implemented. Fig. 13 presents a suggested Sustainability Development Framework to retrofit the existing high-rise buildings in Dubai:

- 1 Conducting comprehensive benchmarking of residential high-rise buildings according to chronological evolution.
- 2 Collecting and analyzing all the required data related to building envelopes.
- 3 Setting up scenarios to solve any existing problems.
- 4 Implementing and testing the suggested scenarios.



FIG. 13 Suggested Sustainability Development Framework. Source: (Author)

The implementation of the sustainability Development Framework applies the following methodology in which the existing buildings are analyzed, documented, categorized and evaluated as presented in Fig. 14.

- The stylistic elements, structural-material and geometry parameters of selected residential high-rise buildings will be investigated to find the common characteristics.
- The present energetic state will be investigated to connect energy demand, footprint area, and architectural characteristics.
- The limiting factors narrowing down the possibilities will be defined.
- After combining the retrofit intervention possibilities and limiting factors, retrofit scenarios will be created.
- Data to support this will be produced through anonymous surveys, observation, the occupation of different settings around the buildings, and meetings (informal and formal) in real-time.

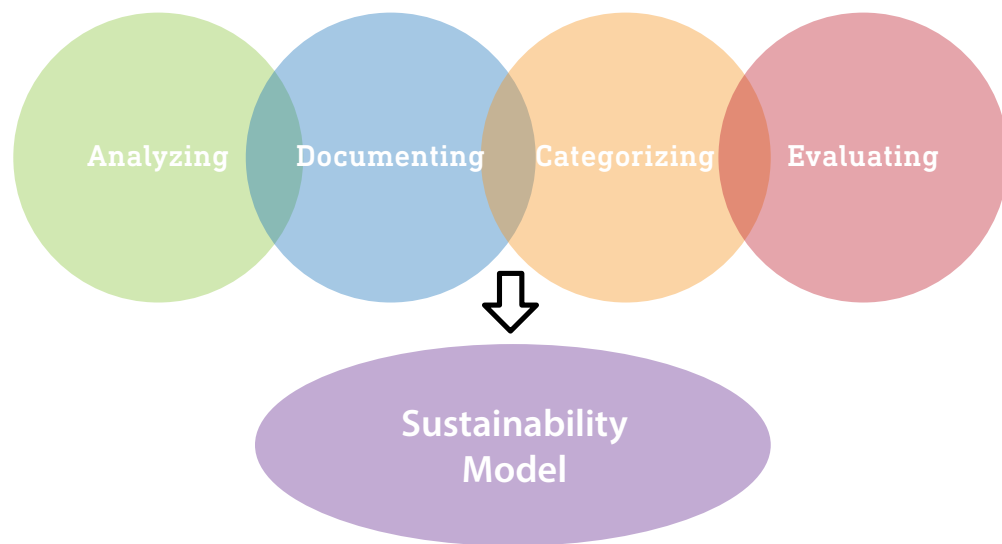


FIG. 14 Sustainability plan implementation methodology. Source: (Author)

The research aims to link the typology of residential (high-rise) heritage over time with a comparison of those different typologies with regard to sustainability (environmental, social, cultural and economic) and to improve the buildings' overall performance.

This results of this research work will contribute and benefit from different Dubai initiatives; Strategies and Smart City initiated by Dubai Government / DEWA, Green Buildings codes & regulations and Architectural Modern Heritage Protection Initiative launched by Dubai Municipality, Urban Heritage and Archeology Department work on Urban Heritage Studies and Sustainable Energy & Energy Efficiency of the Supreme Energy Council.

5 CONCLUSION

This paper traces the evolution of high-rise buildings in City of Dubai. It aims to clarify why high-rise residential buildings, in particular, are a valuable strip of Dubai modern heritage and explore realistic strategies to save this legacy. This includes raising the awareness about the importance of the value of modern heritage, the establishment of a database containing buildings classified from the 1960s, 1970s, and 1980s, which will be updated to document and protect the architectural heritage of this period. It also aims to inform and engage stakeholders about the potential of retrofit decisions for modern heritage buildings in Dubai and using a sustainable solution that utilizes green and clean energy.

The high-rise buildings presented in this work had a huge effect on shaping the urban landscape and crystallizing the architectural character of the City of Dubai during the 1970s and 1980s. The results of this research will help the government authorities throughout the UAE to develop more detailed and applicable regulations that enhance sustainability in the residential sector and protect the heritage.

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