The Sustainability of Egyptian Modern Architecture

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Abstract. HVAC proliferation has had a lasting effect on architecture, forcing buildings to comply with the infrastructural and newly acquired physiological requirements. Daniel A. Barber argues that air conditioning successfully hijacked modernist internationalism and turned it into an essential tool for extracting and concentrating wealth. In the sustainability discourse, modernist architecture is often blamed for practices and design-logics that are not ecologically conscious. On the other hand, despite ongoing efforts by academics and practitioners to deconstruct current notions of sustainability, sustainability is yet to integrate the rich contributions of modernism. The paper investigates how Egyptian pre-HVAC modern architecture addressed contemporary sustainability concerns through a structured thematic analysis of Egyptian Modernist Sayed Karim’s (1911-2005) work. Different features are extracted and mapped in the analysis of four cases to study how the architect balanced between the ecological, social/cultural, aesthetic, and functional motives. Some elements, such as zoning and shared or common spaces, strike a balance between these dimensions and instigate a rethinking of what Egyptian modernists can offer to the sustainable design field. The analysis presented opens a new venue for how today’s sustainable architecture movement can benefit from Global South modernism, taking passive ventilation strategies as precedent.

1. Introduction

In the sustainability discourse, modernist architecture is often blamed for the generation and perpetuation of irresponsible practices that negatively contribute to the environment. Vandevyere and Heynen argue that “the…discourse should be conceived as a…revised version of the paradigm of modernism” altogether, instead of pitting them against each other [1]. They recommend that modernism should not be conflated with technocratic paradigms and that sustainability avoid searching for a “singular optimal technological pathway” [1]. Despite ongoing efforts by academics and practitioners to deconstruct current notions of sustainability, sustainability is yet to integrate the rich contributions of modernism.

A point of contention in the history of modernism is the proliferation of heating, ventilation, and air conditioning (HVAC). HVAC proliferation has had a lasting effect on architecture, forcing buildings to comply with the infrastructural and newly acquired physiological requirements. This paper sheds new light on the sustainable and ecological design inspirations that pre-HVAC modernism can offer. It does so by investigating Egyptian modernist architecture and theories. The study critiques the exclusion of Global South modernist architecture from the sustainability movement—often overlooking their concern for passive means of ventilation for the sake of reductionist and orientalist understandings of vernacular examples. Through a structured thematic analysis of the work of Egyptian Modernist Sayed Karim (1911-2005), the paper proposes a more integrated, holistic, and critical understanding of the many meanings of “sustainable architecture.” This is portrayed by examining evidence of sustainable design.
principles in the architect’s work, including passive environmental control strategies as well as cultural, social, and economic considerations regarding the prospective users and building context.

2. Background and Theoretical Approach
The integral role of sustainability in architectural academia, practice, and research is a testament to its close connection to history, natural science, culture, politics, and capital [2, 3, 4]. It is natural to expect that sustainability will continue to play a pivotal role, especially with the imperative risks posed by the Anthropocene. According to Owen and Dovey, the advancement of sustainable architecture needs to begin to position “both sustainability and architecture as social practice” [3]. This would represent the natural transition expected from the sustainability discourse, as the scope of practice and theory gradually increased as the transition from “green” to “eco-” to “sustainable” took place [4]. Guy and Framer contest the positivist assumptions underpinning sustainable architecture practice and research and urge the adoption of a social constructivistic perspective instead [5]. Jarzombek even explains that the concept itself has a lot to learn, as it has not yet successfully replaced the socio-political parameters that it counters [2]. Despite the emergence of modernism before the establishment of sustainability as it is understood today, both ideals share foundational ethos.

Modernism and sustainability are not mutually exclusive but are highly compatible in different respects. When technology and sustainability are brought up, we consider the vernacular a nobler precedent than modernism [6]. Harlow et al. showcase that the history of sustainability discourse is intertwined with utopian themes, almost congruent with modernist architects and thinkers [7]. As such, modernism can be inferred to be intrinsically sustainable and intellectually concerned with the betterment of human lives through the built environment, including environmental and ecological scopes understood today through sustainability. Therefore, it is anachronistic to disregard modernist architecture in the current sustainability discourse for failing to hold up to contemporary practices and objectives.

Modernism can be construed as the enabler of mechanical ventilation. However, Barber explains in Modern Architecture and Climate [8] that HVAC successfully hijacked the modernist movement since its commercial inception in the 1930s. Barber’s book exhibits the sensitive design consideration of Le Corbusier and other architects to environmental control by examining the detailed drawings of their buildings. Through the work of Olgyay and the marketing of HVAC, occupational expectations and building requirements changed to accommodate the newly founded necessity of air conditioning. Air conditioning, not modernism, relieved architects from the constraints of passive ventilation requirements and allowed for thinner building shells and skins [9].

In order to reconsider the place of sustainability in modernism, it is advisable to reassess the reductionist and romantic notions that embody vernacular architecture as both are often pitted against each other in academia and practice. Instead, Lara suggests that modernism can be made vernacular, explaining through his study of modernist Brazilian architecture that modernism should not be conceived as the opposite of the vernacular, but both are instead in a dialectical relationship [10]. Such emerging scholarship on vernacular architecture deconstructs the boundaries and strict connotations attached to modernism when considering the sustainability discourse, especially after looking at how HVAC came to take hold of our building practices. It is, therefore, necessary to work towards “Sustainable Modernism” through the adoption of modernism’s legacy and “accepting that there is continuity between the desire to be modern and the imperative to be sustainable” [10].

Published literature rarely studied pre-HVAC modernist buildings of Egypt from an ecological lens. Specifically, and to the best of the authors’ knowledge, no previous research has studied how modernist Egyptian buildings and architects have addressed contemporary sustainability concerns: the environmental, social, economic, and cultural dimensions.
3. Methodology
The selected paradigm of the research is shared with Vandevyvere & Heynen, which is the epistemological stance on modern architecture that presumes the environmental, ecological, social, and technical stances of modernism as part and parcel of sustainability [1]. The research methodology employed utilizes interpretive-historical analysis of modernist architecture to evaluate the relevance of its design decisions to sustainability.

A single case study is selected, where the drawings and theoretical and ideological contexts are explored. Using Ashour’s categorization of modernist architects of the 20th century, Sayed Karim is selected as the case study as his architectural career was before the proliferation of HVAC in Egypt [11]. Sayed Karim produced many architectural works, but he was also an influential figure in the architectural field. He voiced his opinions and concerns over the city’s future in his magazine (Al’Imara), his book Ishtirakyat Al Villa, and numerous newspaper articles. Architecture journals are invaluable resources in understanding the social production of space of time, as showcased by El-Ashmouni’s examination of Alam Al Benaa [12]. Incidentally, Sayed Karim’s archive is available at the American University in Cairo (AUC) Library, making his architectural legacy readily available for research and analysis.

The documents used for the analysis include the drawings for the selected buildings along with Karim’s personal writings and relevant issues of Al’Imara magazine. In order to fairly assess Karim’s sustainable design principles, the criteria of selection were confined to residential buildings designed between 1945 and 1960, well beyond the emergence of HVAC as a viable climatic control solution for residential architecture. Therefore, the following buildings were selected for analysis: El Maadi Building (circa 1945); Al Goheni Building, Heliopolis (1948); Zamalek Tower (1953); and Housing Model 10, Nasr City (1959).

![Figure 1 El Maadi building, AUC RAC.](image-url)
Figure. 2 El Goheni building, Al'Imara Magazine.

Figure. 3 Zamalek Tower, Al’Imara Magazine.
The research involved critically assessing the drawings of the buildings while exploring Karim’s writings in Al’Imara magazine. The data was derived from the architect’s archives and secondary sources. The analysis strategy was designed to create a visual mapping of the sustainable features of the buildings. The identified design elements were then plotted on a matrix that frames the different motivations for the design elements. This mapping method has been gaining popularity in recent works since it aims to highlight the tensions and often competing motivations embedded in sustainable building practices [12, 13].

The chosen matrix, presented in Figure 5, frames the design elements’ ecological/ climatic, socio-cultural, functional/ technical, and aesthetic extents. Here, the poles were selected to identify the main motives of design elements, supported by written texts or other international examples. The poles represent the criteria used to assess architecture’s sustainability and showcase the design conflicts often expected from technocratic modernism [1]. Borrowing Guy and Farmer’s social constructivist perspective on the multiple competing ecological logics that determine the assessment and design of sustainable architecture, the matrix the two most common design conflicts in sustainability between technical/ functional and aesthetic performances and between ecological/ environmental/ climatic and socio-cultural considerations [5]. After an assessment of the selected buildings’ floorplans and secondary sources was conducted, specific design decisions and features were cataloged while paying careful attention to maintain consistency. As seen in tables 1 to 4, the cataloged design features were then mapped on the matrices according to their relative achievement of the four poles.

**Table 1.** El Maadi building’s sustainable features catalogue.

| No. | Item                |
|-----|---------------------|
| 1   | Shading Devices     |
| 2   | Zoning              |
| 3   | Openings            |
| 4   | Double Wall         |
| 5   | Greenery            |
| 6   | Self Shading        |
Table 2. El Goheni building’s sustainable features catalogue.

| No. | Item                          |
|-----|-------------------------------|
| 1   | Shading Devices               |
| 2   | Cross Ventilation            |
| 3   | Daylighting                   |
| 4   | Self Shading                  |
| 5   | Garbage Collection-Fuel       |
| 6   | Zoning                        |
| 7   | Openings                      |
| 8   | Duplexes                      |
| 9   | English Court                 |

Table 3. Zamalek Tower’s sustainable features catalogue.

| No. | Item                          |
|-----|-------------------------------|
| 1   | Shading Devices               |
| 2   | Cross Ventilation            |
| 3   | Self Shading                  |
| 4   | Garbage Collection-Fuel       |
| 5   | Zoning                        |
| 6   | Openings                      |
| 7   | Duplexes                      |
| 8   | Mixed Use                     |
| 9   | 3 Elevators                   |
| 10  | Central Boilers & Heaters     |
| 11  | Penthouses                    |
| 12  | Bricks Used                   |
| 13  | Balconies & Rooftops          |

Table 4. Housing Model 10’s sustainable features catalogue.

| No. | Item            |
|-----|-----------------|
| 1   | Forgotten Floor |
| 2   | Compactness     |
| 3   | Parking         |
| 4   | Mixed Use       |
| 5   | Openings        |
| 6   | Rooftop         |

Elements that fall closer to the mid-point of the map have well-integrated motives and possibly embody a sustainable design approach (understood from a contemporary sense). Said otherwise, a design element that has a clear social, ecological, economic, technical, and aesthetic function is one that can be understood as a result of a unified approach to design closer to the deep ecology Madge [4], and others have called for. The matrix lays the groundwork for explaining the nature of Karim’s projects’ sustainable design decisions, showcasing the general direction of the sustainable design employed for each building as well as assessing the extent of technocratic ideals in Egyptian modernism. Thus, the research methodology is designed to identify Egypt’s modern architecture’s sustainable features and provide a preliminary showcase of the design issues considered as they relate to sustainability.
4. Findings and Implications

Although undated, El Maadi Building can be considered one of Karim’s earlier works and was commissioned by a private patron. The building presents simple yet effective climate-control strategies and environmental considerations. On the other hand, Al Goheni Building and Zamalek Tower were essential points of departure for the architectural discourse of the period, as exemplified in their analysis in Al’Imara magazine. The two buildings are more monumental than El Maadi building in both scale and sustainable consideration, exhibiting more overt sustainable design decisions. Although no evidence of the analysis of Housing Model 10 in Al’Imara magazine exists, the conception of Nasr City in and of itself is a significant turning point in the architectural history of Egypt. The building is designed for middle-class users [14] and is a powerful example of Karim’s attempts to reconcile his modernist ideals on planned housing with socialist sentiments of the time of its design. It is evident that the drawings of Housing Model 10 were rudimentary, especially when compared to the building as it stands today.

It is safe to posit that the selected buildings’ drawings are a gateway into the architectural thinking of Sayed Karim, and therefore give valuable insight into the sustainability concerns of Egyptian modernism. As reflected in the matrices, no specific patterns are connecting the buildings examined, suggesting that sustainable design tools were employed depending on the needs and requirements of each building. As such, the understanding of modernism as a technocratic design manifesto is refuted, and Egyptian modernism is shown to be considerate of a wide range of sustainable concerns that touch ecological and social domains. Given the emergence of modernism prior to the rise of the sustainability discourse, Karim’s work does not exhibit a specific ecological, technical, or socio-cultural approach. Coupled with the lack of affordability of HVAC at the time, Karim’s sustainable approaches are integrated into the overall design, rendering sustainable features part of the thoughtful design decisions executed without the dependence on active climatic control. The buildings investigated showcase an array of approaches that address the needs of the users and patron while simultaneously creating sustainable architecture, all under the umbrella of (Egyptian) modernism [15].

The mapping results conducted on the buildings are presented in figures 6 to 9. El Maadi building’s sustainable features are primarily functional and focus on climatic control (Figure 6), while El Goheni Building’s sustainable features are relatively well balanced, covering ecological concerns while addressing functional, aesthetic, and socio-cultural design needs (Figure 7). Due to the functional requirements of Zamalek Tower, many of the sustainable features pertain to the efficient and culturally-appropriate operations of the building. Nevertheless, climatic control is addressed (Figure 8). Like the Zamalek Tower, Housing Model 10’s sustainable concerns relate to the operational scale of the building, reflecting Karim’s concepts for mass middle-class housing (Figure 9).
The results lead to a better understanding of Egyptian modernism’s sustainable design concepts and applications and bring to light the holistic integration of, what is currently referred to as, sustainable architecture. It is clear that many of the features of the buildings, such as shading devices and zoning, were usually informed by environmental consideration (wind-direction and sun-angles) – serving ecological and functional parameters in the design. In many cases, the openings (windows, doors, etc.) followed a more aesthetic approach and often addressed social-cultural concerns of privacy, engrained in the Egyptian culture. In many instances, such as in El Goheni building and the housing model 10, common features, such as the English court and the roof, were utilized to balance competing motives. Similarly, in all studied cases, except the El-Maadi building, zoning was utilized to fulfil the functional needs of the projects and address the ecological concerns and socio-cultural considerations. In line with the modernist movement, zoning formed the main driver for the building form generation, directly informing the aesthetic and symbolic dimension of the project. Thus, it can be argued that these elements offer compelling sustainable design approaches needing further technical analysis and studies.

**Figure. 6** El Maadi building’s sustainable features Mapping.

**Figure. 7** El Goheni Building’s sustainable features mapping.
5. Conclusions
This research paints a clearer picture of modernist architecture’s contribution to sustainable architecture and practice, thereby reinforcing Vandevyvere & Heynen’s stance on the place of modernist architecture in sustainable development [1]. As presented in figures 1 to 4, the literature and this paper’s hypothesis have been validated, pointing to the presence of ecological, functional, socio-cultural, and aesthetic concerns often overlooked when assessing the sustainability of modernist architecture. The sustainable design decisions documented highlight the subtle and thoughtful integration of sustainability, pointing to the philosophical common ground between modernism and sustainability.

As argued by Guy & Farmer, sustainability should be recognized as an academic construct, one that can be restraining and anachronistic [5]. Sustainable design features are not confined to technological advances or ancient and vernacular practices but extend to include modernist designs and approaches that reflect users’ climatic and socio-cultural needs. Egyptian modernist architecture, and other examples from the Global South (and North), has the potential to enrich sustainable architecture as opposed to being its “absolute counterpoint” [1]. The research results stress the importance of further investigating the performance of Karim’s sustainable design elements while extending the ideological and theoretical stances of modernist architects. Not only will such an endeavor enrich our understanding.
of the architectural discourse of the 20th century, but it will also help develop better connections to sustainability.

6. References

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