

MODERN ARCHITECTURE IN IRANIAN HOUSING DURING THE PAHLAVI ERA: A SUSTAINABILITY PERSPECTIVE

PEHLAVI DÖNEMİNDE İRAN KONUTLARINDA MODERN MİMARLIK: SÜRDÜRÜLEBİLİRLİK PERSPEKTİFİ

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Abstract

This study examines the integration of sustainability principles in Iranian residential architecture during the Second Pahlavi era, a period marked by the influence of European-trained architects and rapid modernization. Ten houses from different climatic regions were evaluated using a matrix-based method encompassing seven criteria: natural lighting, ventilation, building materials, climatic adaptation, green/open space, passive energy strategies, and spatial form. Each criterion was assessed on a four-point Likert-type scale based on archival photographs and drawings. Each criterion was assessed on a four-point Likert-type scale (0–3), where 0 indicates no integration and 3 indicates full integration. Total scores were calculated on a 21-point scale, and the houses were classified into three groups: low performance (0–9), moderate performance (10–14), and high performance (15–21). Results indicate that, despite the dominance of modernist aesthetics, many homes retained vernacular strategies, reflecting a hybrid design approach. The findings highlight the coexistence of tradition, climatic awareness, and modernism, offering new insights into sustainable architectural heritage.

Key Words: Modern Iranian Architecture; Pahlavi Period; Sustainability Evaluation; Passive Strategies

Öz

Bu çalışma, Avrupa'da eğitim görmüş mimarların etkisi ve hızlı modernleşmenin damgasını vurduğu İkinci Pahlavi döneminde İran konut mimarisinde sürdürülebilirlik ilkelerinin entegrasyonunu incelemektedir. Farklı iklim bölgelerinden on ev, yedi kriteri kapsayan matris tabanlı bir yöntem kullanılarak değerlendirilmiştir: doğal aydınlatma, havalandırma, yapı malzemeleri, iklim adaptasyonu, yeşil/açık alan, pasif enerji stratejileri ve mekansal form. Her kriter, arşiv fotoğrafları ve çizimlere dayalı olarak dört puanlık Likert tipi bir ölçekte değerlendirilmiştir. Her kriter, 0'ın entegrasyon olmadığını, 3'ün tam entegrasyon olduğunu gösteren dört puanlık Likert tipi bir ölçekte (0-3) değerlendirildi. Toplam puanlar 21 puanlık bir ölçekte hesaplandı ve evler üç gruba ayrıldı: düşük performans (0-9), orta performans (10-14) ve yüksek performans (15-21). Sonuçlar, modernist estetiğin hakimiyetine rağmen, birçok evin yerel stratejileri koruduğunu ve bu da melez bir tasarım yaklaşımını yansıttığını göstermektedir. Bulgular, gelenek, iklim bilinci ve modernizmin bir arada varlığını vurgulamakta ve sürdürülebilir mimari miras hakkında yeni içgörüler sunmaktadır.

Anahtar Kelimeler: Modern İran Mimarisi; Pahlavi Dönemi; Sürdürülebilirlik Değerlendirmesi; Pasif Stratejiler

INTRODUCTION

ya The Pahlavi era represents a critical period in Iranian architectural history, marked by the intersection of modernist global trends and traditional local design. This transformation shaped contemporary Iranian architecture and offers valuable insights into innovation and cultural continuity. Research on Iranian residential architecture during the first and second Pahlavi periods has demonstrated that modernization not only affected the physical form of houses but also influenced cultural and social concepts. Scholars such as Nabizadeh and Ulusu Uraz (2017) demonstrate how the modern house became a tool for showcasing national progress while preserving traditional everyday patterns. Similarly, Gholami et al. (2021) analyzed spatial transformations in middle-class housing using shape grammar, revealing how urbanization and social change influenced the architectural form. Studies by Haghjou et al. (2019) and Bani-Masoud (2020) further emphasize how state-driven planning, development programs, and Western-inspired design principles shaped urban housing during this period. These initiatives often prioritized industrial materials and aesthetics over climatic responsiveness or cultural continuity. On the other hand, recent works such as Karimzadeh et al. (2025) and Ghasemi et al. (2024), focus on transforming domestic spatial typologies and the liminality of space in Tehran's modern residences, underscoring shifting lifestyle expectations and the evolving identity of domestic architecture. Cultural journals of the period, such as *Architect Magazine*, advocated for incorporating traditional principles. Discussed the importance of designing a house based on home hygiene and paying attention to sunlight and air conditioning. In another article published in the same magazine, it was mentioned that attention should be paid to the principles of the Iranian house (Moshiri, 1948). Therefore, when designing houses, architects should consider Iranian architecture and climatic principles in addition to the principles of European architecture ("Our Home," 1948).

This research examines how residential buildings constructed during the Second Pahlavi era integrated vernacular sustainability principles amid the rise of modernist influences. It seeks to answer the following research question: To what extent did mid-20th-century Iranian houses reflect sustainable design strategies, and how did these approaches vary across different climates and building forms? The study further evaluates whether climatic responsiveness was intentionally embedded or passively retained from traditional typologies. Ten residential houses were constructed between 1947 and 1976 during the second Pahlavi era, which is the focus of this analysis. The selection was based on the availability of architectural documentation, such as plans and photographs, as many houses from this period have either been destroyed or are at risk of demolition. The chosen case studies remain physically intact

and accessible through architectural journals and credible online archives. At the same time, it is commonly believed that the influence of European education and modernist ideals led architects of this era to overlook sustainable design principles. The study aims to address the research gap on the sustainability performance of Pahlavi-era Iranian residential buildings by proposing a sustainability assessment matrix based on vernacular architectural principles. It evaluates selected Pahlavi-era houses across different climates to determine whether modern residential design has retained or diverged from environmentally adaptive traditions, despite numerous studies examining the transformation of Iranian residential architecture during the Pahlavi era.

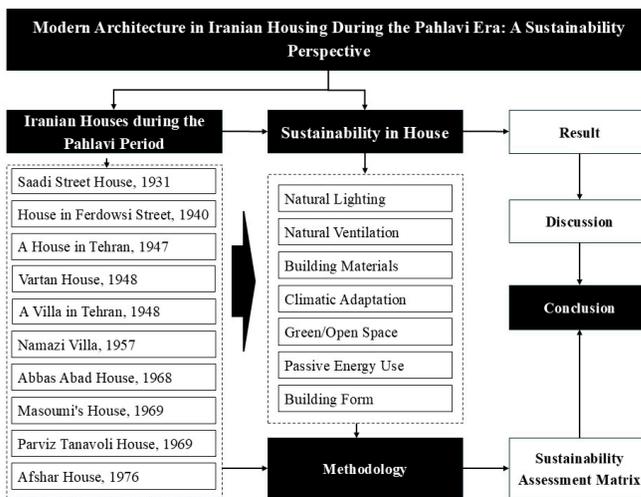


Figure 1. The Research Process

1.1 Iranian Houses During the Pahlavi Period

During the second Pahlavi period, modern architecture emerged as the dominant trend in Iranian architecture, influenced by European architects and trends such as the International Style and the Bauhaus School. This led to the development of the Iranian form of modern architecture known as ‘Modernist Architecture.’ A parallel current emerged between the 1960s and 1970s, influenced by Iranian intellectual movements and a blend of International Style and eco-architecture. The works of this movement are often considered to be influenced by postmodern Europe and postmodernism, reflecting the influence of postmodern Europe and postmodernism on Iranian architecture (Haghjou et al., 2019). The architecture of the second Pahlavi period, often associated with the so-called “second-generation pioneers”, was shaped by three main forces: Western cultural influences, Iran’s historical heritage, and

the rising prominence of professionally trained architects. The West’s influence has significantly influenced Iranian life and thought, while the historical heritage is the primary source of Iranian cultural and intellectual life. As creators and narrators of culture, architects have played a vital role in mediating between Western culture and Iran’s cultural heritage. In the 1940s and 1950s, Iran underwent two significant architectural movements: European architecture, which focused on modern design and materials, and cultural ecologism, which sought an ‘Architecture of the Self.’ These approaches significantly influenced the development of Iranian architecture and shaped the country’s architectural landscape (Ghobadian, 2014)

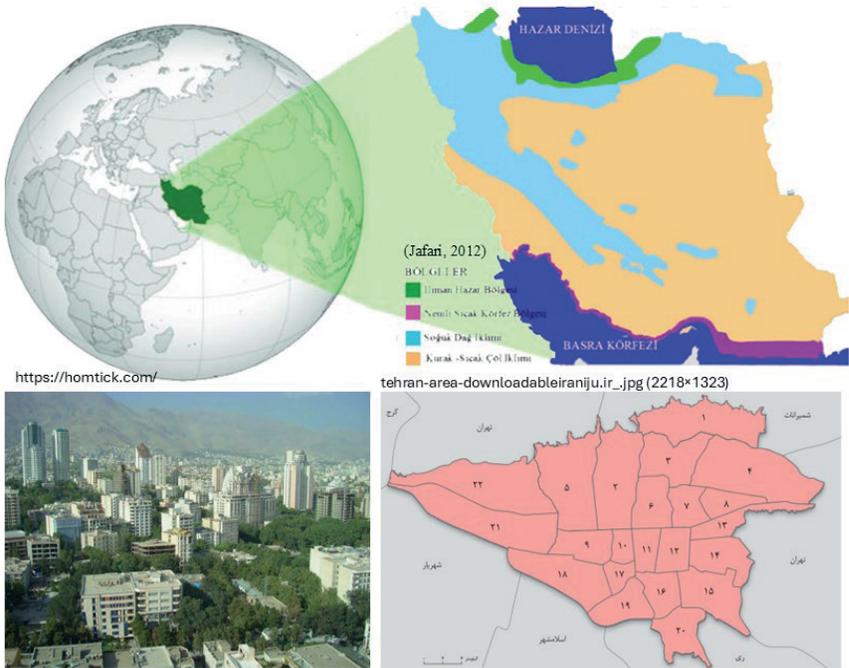


Figure 2. The Location of the Site

Modern architecture in Iran developed in parallel with its worldwide evolution in the 1960s. Iranian architecture, influenced by modern architectural practices that continue to shape the world, differs significantly from traditional housing in its urban environment by constructing the same buildings in diverse climate zones. During the 147-year rule of the Qajar Dynasty, which adopted a policy approach closely aligned with Russia politically, Iran moved away from its rich cultural and historical heritage. Reza Shah, who ascended to the throne after this period, employed traditional Iranian architecture to foster a sense of

nationalism and achieved success. During the Pahlavi Period, the influence of Iran’s German advisors, the rising Fascist influences in Europe, and the impact of architects who went abroad to receive education all had a profound effect on architecture (Khaleghimoghaddam, 2019). One of the two critical features of this period is the pre-Islamic architectural style, and the second is the use of the architectural style of the works of Persian (Pasargad) architecture (Zabihi, 2010). The effects of this architectural style, which continued until the Second Pahlavi Period (1941-1979), were evident in the construction of Western-style high-rise buildings. Many high-rise apartment buildings were built in Tehran during this period. During the Pahlavi period, houses were built according to similar types, but environmental and climatic factors were taken into consideration when designing dwellings (Figure 3). Similar factors were considered in each of the four different climates.

Climate Type	Material	Plan Form	Roof Type	Settlement	Building-Ground Relationship	Wall cavity	Facade Color
Hot and Arid Desert Climate	Wood, Stone, Concrete, Mosaic	Rectangle	Flat	South-East	On Natural Soil	Less	Dark and Light
Cold Climate		Rectangle	Flat	South-East, South-West	On Natural Soil	Less	Dark and Light
mild and humid		Rectangle	Sloping	East-West	Wood-Stone On Feet	Less	Dark and Light
Humid Hot Climate		Rectangle	Flat	South-East	On Natural Soil	Less	Dark and Light

Figure 3. *Characteristics of houses in the Pahlavi period*

1.2 Sustainability in the House

The natural environment complements the artificial environment in the human habitat, with natural factors influencing design, spatial organization, and material selection. According to Kquofi and Glover, (2015), the natural context shapes the built environment by informing its structure and spatial qualities, which are essential to expressing the physical and aesthetic character of a house. In the Iranian context, Kasmaei (2003) emphasizes the role of environmental elements and climatic adaptation in enhancing comfort and spatial quality through the use of passive energy. In hot and dry climates, Ergün and Bekleyen (2024) developed a taxonomy of passive design strategies, grouping them according to similarities in function to improve accessibility and clarify relationships between strategies.

From an international perspective, Rodriguez-ubinas et al. (2014) argue that passive design should go beyond basic parameters such as thermal comfort, daylight, and air quality, noting that highly efficient buildings require multidimensional and sometimes contradictory design decisions. Similarly, Jayasena et al. (2022) highlight that passive houses aim to optimize energy gains and losses to achieve higher efficiency, improved comfort, and greater affordability, using a social cost–benefit framework to evaluate passive technologies.

Monavari and Tabibian (2006) emphasize the importance of integrating green and open spaces, mitigating ecological risks, utilizing local and renewable resources, and minimizing pollution through adaptive architectural solutions. Yari Boroujeni et al. (2020) reinforce these principles by emphasizing the relationship between spatial form, environmental context, and sustainable resource use. These perspectives, drawn from both local and international literature, informed the sustainability assessment matrix applied in this study, which evaluates seven core indicators: natural lighting, natural ventilation, building materials, climatic adaptability, green/open space, passive energy performance, and architectural form.

I. Material and Methods:

This study employs a qualitative, comparative methodology to assess the sustainability features in Iranian residential architecture during the Second Pahlavi era (1947–1976). Due to limited access to historic buildings (many of which have been altered, demolished, or remain inaccessible), the research relies on secondary data, including architectural drawings, photographs, archival publications, and academic literature. Ten residential buildings were selected based on the availability of documentation, architectural relevance, and geographic diversity. The selection criteria ensured that each house was architecturally significant, visually documented, and situated in different climatic regions of Iran, thereby allowing a comprehensive evaluation of climate-adaptive strategies.

A tailored Sustainability Assessment Matrix was developed to evaluate the environmental performance of each selected house. This matrix was informed by existing literature on vernacular Iranian architecture and sustainable housing design, particularly the works of Ghobadian (2014), Kasmaei (2003), and Yari Boroujeni et al. (2020). The assessment focused on seven key criteria derived from traditional architectural principles: natural lighting (NL), natural ventilation (NV), building materials (BM), climatic adaptation (CA), green and open space (G/OS), passive energy use (PEU), and building form (BF). These indicators reflect the building's responsiveness to its environmental

context and its use of passive design strategies rooted in local knowledge. Each building was assessed using a 4-point Likert-type ordinal scale (ranging from 0 to 3). This statistical evaluation method, widely known as the Likert scale, ensured consistency and comparability across cases. Here, 0 indicates no integration, 1 = minimal integration, 2 = moderate integration, and 3 = full integration of the feature.

This scale aligns with established post-occupancy evaluation practices in sustainable architecture. It helps to reduce interpretive bias. Scores were assigned through comparative analysis of spatial organization, form, façade treatment, and documented material use. This semi-quantitative approach enabled the identification of trends across cases. Qualitative interpretation of architectural layouts and photographic evidence also informed the assessment. It was used to assess spatial narratives, cultural continuity, and shifts from traditional to modern domestic design. Performance classification was based on the total sustainability score, with a maximum of 21 points. Scores of 0–9 were considered low performance, 10–14 moderate, and 15–21 high performance.

2. Analysis

A total of ten residential houses from the Pahlavi era were selected for analysis. The process began by documenting each case, including the name, construction date, architectural plan, and photographic evidence. The study focused on identifying how each house responded to key sustainability criteria, particularly those visible in the interior layout, such as natural lighting, ventilation, material choices, and spatial integration. Each case was evaluated using a structured assessment matrix, which enabled a systematic comparison across all examples. Below is a refined summary of the analysis, integrating detailed architectural observations:

Saadi Street House demonstrates a well-thought-out approach to passive design. Vertical façade cuts allow sufficient daylight, and the courtyard structure supports cross-ventilation. The combination of brick and stone is well-suited for Tehran's climate, while thick walls and strategic orientation contribute to climatic adaptation. Despite limited green space, the envelope design attempts passive energy performance. The building form balances modern aesthetics with climatic needs. *The house on Ferdowsi Street* excels in natural lighting and ventilation, thanks to its large openings and efficient plan. It utilizes locally sourced materials typical of the era, featuring a solid envelope that provides climatic adaptation. Although green space is limited, it incorporates passive strategies such as thermal mass and orientation. The form is responsive to the local environment. *A house in Tehran* also

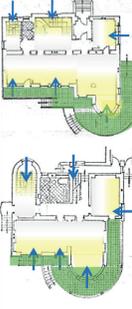
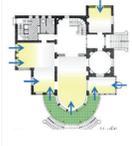
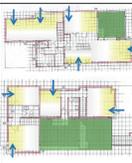
performs well in terms of passive lighting and airflow. Using locally sourced materials, such as concrete, brick, and decorative elements, adds to material sustainability. It features thick walls and shading devices for climate control and has some open space. Passive systems and orientation contribute to energy performance, and its form, a two-story rectangular volume, is moderately responsive. *Vartan House* employs traditional window proportions for daylight and practical ventilation. Stone and brick construction suits the local context. Heavy massing and covered areas help regulate heat, while limited yard space accounts for reduced green space. A combination of veranda, pool, and plantings supports passive energy use, and its recessed and shaded form enhances climatic compatibility. *Villa in Tehran* uses light shafts and vertical windows, with a patio layout that promotes ventilation. Traditional brick and stone contribute to sustainability. Though not entirely passive, the massing and envelope provide some thermal benefits. The small central garden adds green space, and the compact, shaded form enhances thermal comfort.

Namazi Villa features large openings and a central void, providing optimal lighting and facilitating airflow through its open floor plan. Modern materials, such as concrete, are used, though local responsiveness is limited. Climatic elements, such as a sloped roof and canopy, offer adaptability, while the surrounding green spaces and passive elements, including shading and ventilation, further support sustainability. The building's rectangular mass, combined with a courtyard, also enhances its response to climate conditions.

Abbas Abad House performs moderately in terms of lighting and ventilation, utilizing modern materials in a regionally sensitive manner. Its massing, balconies, and shading adapt to Tehran's hot-dry climate. Although green space is minimal, the thick envelope contributes to passive performance, and the building's form partially responds to solar conditions. Masoumi's House provides decent natural lighting but limited ventilation. Materials are urban-modern with little regional distinction. It lacks a passive solar design, though a small garden offers some green relief. There is no evident passive energy strategy, and the overall form appears driven more by aesthetics than environmental concerns.

The Parviz Tanavoli House excels at utilizing natural light, particularly in studio areas, and its multidirectional layout facilitates airflow. The material blend combines traditional and modern features, while passive shading aids in heat reduction. While not a conventional courtyard, moderate garden spaces exist, and the House relies partially on passive massing. The overall form suits the climate moderately. *Afshar House* uses proper orientation for lighting and efficient ventilation. A mix of concrete and natural materials adds sustainability.

It offers moderate climate responsiveness and has a private garden. Passive thermal features, such as thermal mass, are present but not dominant, and the form, although modern, incorporates essential climate adaptations.

	House	Plan	Photo
1	Saadi Street House, 1931 ("Residential Houses," 1947)		
2	House in Ferdowsi Street, 1940 ("Architect 4," 1947; Rad, 2021)		
3	A House in Tehran / Vartan Hovanesian, 1947 (Architect 5, 2016)		
4	Vartan House, 1948 (Dibats Studio, 2017)		
5	A Villa in Tehran, 1948 (A Villa in Tehran, 2025; Bani-Masoud, 2020)		
6	Namazi Villa, 1957 (Namazi Villa, 2016)		
7	Abbas Abad House, 1968 (Honare Memari, 2024)		

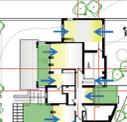
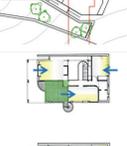
8	Masoumi's House, 1969 <i>(Masoumi's House, 2020)</i>		
9	Parviz Tanavoli House, 1969 <i>(Rahimi, 2018)</i>		
10	Afshar House, 1976 <i>(Saremi, 2020)</i>		

Figure 4. *The Pahlavi era's house in Tehran*

The sustainable features of interior design in selected Pahlavi-era houses are shown in Figure 5. The analysis of interior photos and architectural layouts reveals that natural lighting and ventilation were fundamental elements of the spatial configuration. Large windows, light wells, and cross-ventilation strategies were frequently employed to enhance indoor comfort. Additionally, the selection of materials demonstrates a focus on thermal mass, tactile quality, and environmental responsiveness. Some interior spaces are also visually or physically connected to semi-open green areas, such as internal courtyards, which help regulate indoor microclimates. These features suggest that even within the interior realm, sustainability considerations were subtly integrated into the design logic of Pahlavi-era residences.

House	Photo
	
Parviz Tanavoli House (Rahimi, 2018)	Afshar House (Saremi, 2020)
	
Namazi Villa (<i>Namazi Villa</i> , 2016)	Masoumi's House (<i>Masoumi's House</i> , 2020)

Figure 5. *Interior Design of Pahlavi's House*

3. Results:

Each house was analyzed based on architectural plans, photographs, and archival documentation from reputable sources. The evaluation employed seven sustainability indicators, summarized in Figure 6, ranging from natural lighting to building form. The results reveal that many Pahlavi-era houses combined traditional design logic with modernist spatial strategies. For instance, Saadi Street House and Ferdowsi Street House effectively integrated passive lighting and ventilation with regionally appropriate materials. A House in Tehran presents a balanced expression of modern residential form, while Vartan House distinguishes itself through robust climate adaptability, achieved through thoughtful massing and shading. In contrast, some houses, particularly Masoumi's House and Namazi Villa, prioritize aesthetic and formal qualities, showing limited incorporation of ecological or passive strategies. Afshar House shares climate-responsive elements with Vartan, but it includes a more integrated garden space. A recurring pattern across the cases is the widespread presence of natural lighting and ventilation; however, fewer examples demonstrate advanced passive energy use or meaningful green spaces. In summary, the houses can be grouped into three categories based on their sustainable performance:

- High-performing examples: Ferdowsi Street House, A House in Tehran, Vartan House, Namazi Villa, Parviz Tanavoli House
- Moderate performers: Saadi Street House, A Villa in Tehran, Abbas Abad House, Afshar House
- Low-performing examples: Masoumi's House

These findings suggest that while sustainability was not always a primary design driver in the Pahlavi era, many houses embedded environmental responsiveness through spatial logic, material selection, and adaptation to local climatic conditions.

	House	NL	NV	BM	CA	G/OS	PEU	BF	Total	
1	Saadi Street House	2	2	2	3	1	1	2	13	
2	House in Ferdowsi Street	3	3	2	2	1	2	2	15	
3	A House in Tehran	3	3	2	2	1	2	2	15	
4	Vartan House	2	2	3	2	1	2	3	15	
5	A Villa in Tehran	2	2	2	2	2	1	2	13	
6	Namazi Villa	3	2	1	3	2	2	2	15	
7	Abbas Abad House	2	2	2	2	1	1	2	12	
8	Masoumi's House	2	1	2	1	2	0	1	9	
9	Parviz Tanavoli House	3	2	2	2	2	2	2	15	
10	Afshar House	2	3	2	2	2	1	2	14	

Figure 6. Sustainability Scores of Case Studies

4. Discussion:

The sustainability assessment of ten Pahlavi-era residential buildings reveals moderate scores across criteria and design approaches, with only a few demonstrating consistent performance across all sustainability indicators. Among the cases, the House in Ferdowsi Street and a House in Tehran achieved the highest scores in natural lighting (NL), natural ventilation (NV), and passive energy use (PEU), each scoring 3 or 2 in nearly every category. These homes reflect thoughtful orientation, thermal massing, and spatial organization responsive to Tehran's climate. In contrast, Masoumi's House scored lowest in passive energy use (0) and had relatively weak performance in climatic adaptation (CA) and natural ventilation (NV). This house, characterized by a more formal and aesthetically pleasing design, prioritizes modern expression over environmental considerations. Namazi Villa, despite its international fame and iconic design, demonstrated a relatively low sustainability score in building materials (BM) and passive energy use. This result reflects the influence of imported modernist aesthetics on local adaptation, a pattern that is also evident in other high-profile villas of the era. On the other hand, Vartan House and Afshar House offer balanced examples. Both houses scored well in building form (BF) and cultural-spatial continuity, preserving elements of Iranian domestic tradition while integrating modern design language. The Vartan House demonstrated superior use of local materials and passive strategies, making it one of the most substantial cases in the sample.

Green and open space (G/OS) remained a weak point across most cases, with limited integration of gardens or courtyards. Even in houses with higher climatic adaptability, the lack of meaningful green zones may reflect the period's urban density pressures or stylistic choices. Overall, the analysis confirms that Pahlavi-era architecture oscillated between traditional and modernist styles. While some houses adopted vernacular sustainability principles, others (especially those influenced by Western design paradigms) showed limited environmental responsiveness. These findings emphasize the need to critically reassess modern heritage through the lens of climate and sustainability. Abbas Abad House, like Masoumi's, had limited passive strategies and relied more on aesthetic layout. Across the sample, houses connected to vernacular architecture (mainly through materials, compact form, and climate-responsive design) are intended to perform better in sustainability metrics than those purely driven by formal modernist aesthetics.

5. Conclusion:

This study assessed ten residential buildings from the Second Pahlavi era using a structured sustainability matrix informed by vernacular Iranian architecture.

The results reveal varied levels of environmental responsiveness across cases. While natural lighting and ventilation were the most addressed criteria, they were often well-integrated through window placement and spatial layout (green/open space and passive energy) use were among the least developed features. This suggests that while comfort and spatial efficiency remained important to designers, explicit ecological design strategies were less emphasized. Among the evaluated buildings, Ferdowsi Street House, Vartan House, and Parviz Tanavoli House consistently scored highest, reflecting a thoughtful balance between modernist form and traditional passive strategies. In contrast, though formally innovative, Masoumi's House and Namazi Villa demonstrated limited adaptation to climate, with weak performance in passive energy use, green space, and climatic adaptability. These findings suggest that houses with stronger connections to vernacular traditions (through massing, material choice, or courtyard integration) tended to perform better in sustainability evaluations. Another major trend observed was the spatial reconfiguration of gardens and courtyards. Unlike traditional Iranian homes with centrally positioned courtyards, many Pahlavi-era homes shifted green areas to one side of the property or confined them to terraces. The introduction of circular and non-rectilinear forms also marked a symbolic and functional break from classical typologies.

Additionally, the orientation of most houses during the Pahlavi period followed the prevailing urban planning codes of the time, resulting in plots that faced north-south. This layout contributed to adequate natural lighting, as southern façades were prioritized for living spaces, dining rooms, and bedrooms. In contrast, east and west orientations, which often received harsh or disruptive sunlight, were minimized or designated for service areas such as kitchens, stairwells, or storage rooms. This spatial logic highlights the integration of environmental awareness within the modernist planning framework of the era. While these buildings may not meet contemporary sustainability benchmarks, they embody a transitional moment in Iranian architecture, where tradition, modernism, and early environmental consciousness intersected. This study contributes to the broader discourse on sustainable heritage by revealing how early modern Iranian housing engaged with innovation and ecological values.

A limitation of this study is its reliance on archival photographs and drawings, which may not fully reveal all passive design elements or their functional performance. While the sample was primarily concentrated in Tehran and its architectural context, minor variations stemming from different climatic conditions, such as wall thickness in hot-arid regions or sloped roofs in humid climates, were partially reflected in the scoring. Future studies could expand the analysis through region-specific comparisons and incorporate field surveys

and environmental analysis to provide a more comprehensive understanding of how climate, context, and design philosophy shaped sustainability in Pahlavi-era housing.

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