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Examination of the Effects of Hot-Humid Climate Data on Structure and Settlement: Antakya Example

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Abstract
Cities, which have hosted diverse civilizations throughout history and are characterized by a multilayered structure, have also played significant roles in shaping today's urbanization policies. Geographic, demographic, economic, and social factors, as well as climatic factors, influence the urbanization process. In this context, Antakya stands out for its historically layered development, as well as the decisive influence of climatic conditions. The hot and humid climate, in particular, has significantly influenced the city's building designs. However, technological advancements and rapid population growth have overtaken traditional construction techniques and brought modern construction techniques, utilizing materials such as concrete and steel, to the forefront. While these production techniques offer structural advantages in producing strong and earthquake-resistant forms, they can weaken the climate-compatible design elements compared to traditional buildings. This can negatively impact the climatic adaptation and environmental sustainability provided by traditional buildings. Innovative designs are being developed to adapt to climatic conditions in the urban development before and after the February 6, 2023, earthquake with elements such as thermal insulation and natural ventilation being prominent. Traditional buildings are shaped by planning, construction, and facade use to withstand climatic factors. Antakya's traditional buildings are designed to adapt to hot and humid climates and focus on heat protection and moisture dissipation. While the region's earthquake risk necessitates the predominant use of modern techniques in building construction, climatic factors still play a significant role in the design of Antakya's houses. In this context, the study examines the changes in the pre- and post-earthquake settlements of traditional buildings in the city under the influence of climatic data. By evaluating the building life cycles of Antakya houses before and after the earthquake, along with climatic (humidity, sun, wind) and topographic data, the study emphasizes the importance of sustainability and climatic adaptation in urbanization processes.

Keywords
Antakya, urbanization, climatic factors

1. Introduction

Many criteria, such as climatic, geographic, and demographic, influence the formation of urban settlement plans. Among these criteria, structures shaped in accordance with climatic conditions can be said to have an impact on the city's development in the settlement planning and construction processes. Antakya, a city that has hosted various civilizations, is one of the cities with both strategic and geopolitical importance throughout history due to its geographical location and climatic characteristics. Climatic factors appear to have played a decisive role in the design of traditional houses in Antakya, located in a hot-humid climate zone [9]. This climatic condition of the region, particularly evident in Antakya's traditional buildings, aims to adapt to the region's conditions and seek solutions to climatic problems. Furthermore, the concept of adaptation to climate and topography remains crucial in contemporary Antakya houses. However, prior to the February 6, 2023, earthquake in Antakya, urban construction rapidly changed with the proliferation of reinforced concrete structures. Compared to traditional structures, buildings exhibit deficiencies in adaptability to climatic conditions. When comparing structures constructed with traditional techniques and materials in the past to those constructed today, it is clear that more concrete and modern construction materials are used today, which can weaken the adaptability of traditional structures to the climate and topography they offer. The increased use of concrete and steel, in particular, has weakened traditional design elements such as natural ventilation and thermal insulation, creating significant energy efficiency problems [9]. However, it can be said that some houses built in Antakya after the earthquake were designed to adapt to climate and topography [10]. Post-earthquake renovation projects, in particular, aim to both increase earthquake resilience and consider climatic adaptation. An examination of the implemented projects reveals that elements such as climate-compatible natural ventilation and thermal insulation/energy efficiency are prominent.

This study examines the differences between pre-earthquake, traditional structures in Antakya and modern structures constructed after the earthquake in terms of building layouts and planning. The literature review created in this context evaluates how the traditional structures of Antakya were shaped before and after the 2023 earthquake in the light of climatic factors (sun, humidity, wind) and topographic data.

1.1. Literature Review

Climate-appropriate building design defines the climate-focused nature of the built environment, and the extent to which the constructed structure positively or negatively impacts the climate is also a factor. Climate-appropriate building design also emphasizes energy-efficient building design. Therefore, a climate-focused building design promotes reduced energy consumption, the wise use of energy, and an approach that ensures the protection of buildings, especially in regions where climate significantly impacts living conditions. The most significant characteristics of hot and humid climates are heavy rainfall, high humidity, low temperature differences between summer and winter, and favourable average temperatures [8]. Building design criteria in these climates have been discussed in various studies. Presented energy-efficient building design criteria for hot and humid climate regions and, in line with literature studies, emphasized the need for site selection, building form, natural ventilation in facade design, and solar control. [15] revealed the effective parameters related to the pre- and post-earthquake construction variables in Antakya. In this context, Antakya has been subjected to significant earthquakes and destruction throughout its history, but he emphasized the necessity of using strong structural elements in the repair and reconstruction processes in order to preserve the city's history. [12] discussed the effectiveness of design parameters for different climatic zones in his study and created a bioclimatic design matrix for Turkish conditions. [16] discussed energy-efficient design parameters for buildings in hot-dry climate zones in his study. In this context, he conducted analyses on the provinces of Istanbul and Mardin, which are located on the same scale of climatic zones determined by the thermal insulation regulations in Türkiye. Within the scope of this study, the traditional buildings of Antakya province, the pre-earthquake building stock, and the post-earthquake new construction approaches were systematically compared in terms of plan typology, facade characteristics, and structural features.

1.2. Methodology

The study employed a qualitative data analysis method. This study examines the shaping of traditional pre- and post-earthquake settlements in Antakya within the context of climatic (sun, humidity, wind) and topographical data. The study examines the city's historical structures and traditional houses, examining the structures through renovation projects undertaken before and after the February 6, 2023, earthquake. The study is supported by relevant literature research and local climate data. The study examines how climatic data shaped settlements in three periods: traditional buildings in Antakya, pre-earthquake buildings, and post-earthquake buildings. The climatic factors (sun, humidity, wind) and structural features (thick stone walls, high ceilings, natural ventilation) that influenced the design of traditional houses in Antakya built before and after the February 6, 2023, earthquake was analysed. Climatic adaptation strategies (energy efficiency, thermal insulation, natural ventilation) in contemporary buildings were examined, and the buildings were compared with traditional structures. How the findings obtained in three periods can contribute to future climate-compatible urbanization processes has been synthesized in a table.

2. Evaluation of Climatic Data in the Context of Urban and Building

Antakya lies in a hot-humid climate zone, and its topography and climatic conditions allow settlement plans to be developed accordingly. Its location between Mount Habib-i Neccar and the Asi River allows the city to develop along an axis extending along the river. The grid plan system (Figure 1), created in line with the prevailing wind directions, supports natural ventilation and microclimate control [6].

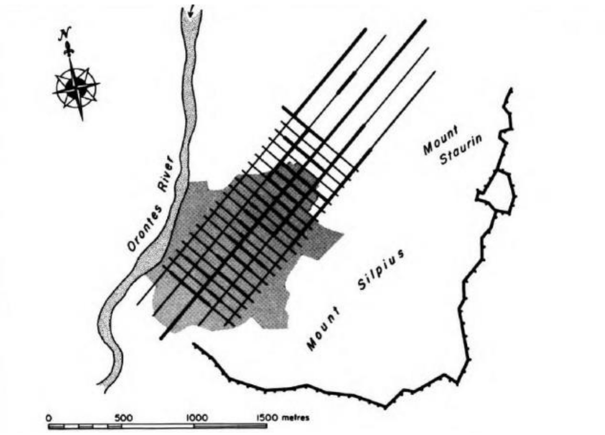


Fig. 1. Old city plan of Antakya showing major axes and traditional building clusters [7]

The street pattern, which develops perpendicularly between the river and the mountain, facilitates the transfer of prevailing winds into urban spaces, contributing to the dissipation of moisture in hot and humid climate conditions. This spatial arrangement demonstrates how Antakya's climate-compatible settlement planning approach has evolved throughout history and how it aligns with the concept of sustainable urbanization [5]. Population growth, developing technology, trade, and other relationships have influenced the change in the city's construction dynamics. Furthermore, earthquakes, which have always been a threat to Antakya, demonstrate that Antakya enters a process of reconstruction after each destruction. As a result of the severe destruction that occurred February 6, 2023, earthquake important historical structures and traditional fabric were damaged in the city. However, considering the city's organic fabric in repair and new construction processes is crucial for preserving its historical past. In this context, the study's second section explores periodic differences in construction.

2.1. Evaluation of Plan Types in Climatic Context

In hot-humid climate zones, plan types and settlement patterns have evolved over time to reduce heat loads and facilitate moisture removal. In this development, the conscious design of open spaces plays a decisive role in temperature control. Courtyards, narrow passages, and inter-building slots direct airflow, increasing natural ventilation efficiency and ensuring temperature control. Decisions regarding temperature control are considered within a holistic planning approach to enhance user comfort and improve energy performance.

3. Field Study: Investigation of the Traditional Characteristics of Antakya Buildings and Their Pre- and Post-Earthquake Conditions

This section includes a field study analysing the traditional characteristics of Antakya buildings, including the plan type, facade, and structural features of pre- and post-earthquake structures, in the context of climate. The findings from the analyses are presented in the findings section.

3.1. Evaluation of Plan Type in Climatic Context

3.1.1. Evaluation of Plan Type Characteristics of Traditional Antakya Houses in Climatic Context

Archaeological research conducted in Antakya, a city with a multilayered history dating back to ancient times, reveals that courtyard-type residential settlements have been used throughout history. These courtyard residential settlements are often located close to each other and, in some cases, are arranged in a contiguous pattern. The urban fabric is shaped by the grid urban plan, which aims to adapt to climatic conditions, along with the diverse configurations of courtyard housing types [5]. Traditional houses in Antakya are constructed with courtyards and are generally two-story. Bearing the traces of different civilizations and with their distinctive architectural features, they hold a significant place among traditional Turkish houses. These houses are constructed entirely of masonry stone or in typologies divided into two: a lower floor of masonry stone and an upper floor of wood [9]. Spaces always open onto the courtyard, ensuring privacy.

The layout plan of a residence shown in Figure 2 also features walls from different periods. In traditional Antakya houses, communication with the outdoors is completely cut off except for the street door. The courtyard layout seen in the plan contributes to the building's natural ventilation, while the idea of creating an open space isolated from the outdoors is also thought to foster an introverted and introverted lifestyle and ensure privacy. The layout of the house: Windows, which provide a visual and physical connection to the street, are generally absent at ground level. This introverted lifestyle is built upon the principle of minimizing contact with the street and obscuring the perception of the interior from the outside.

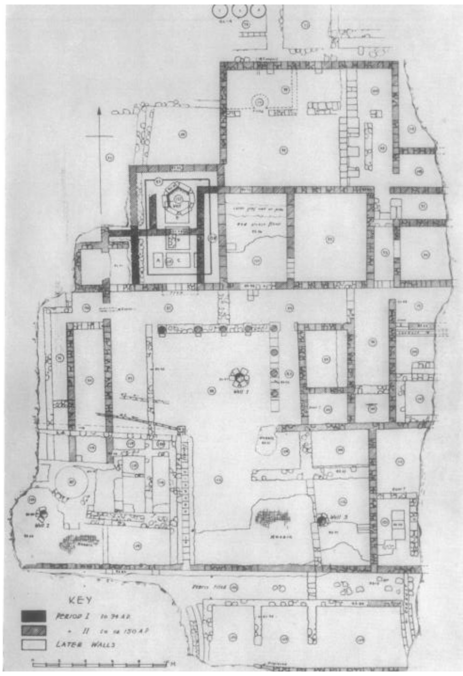


Fig. 2. Traditional Antakya house plan showing the introverted layout organized around a central courtyard (Stillwell.R, Houses of Antioch)

Accordingly, in traditional Antakya houses:

- **Building Location Selection**: The region chosen between the Asi River and Mount Habib-i Neccar was characterized by proximity to water, favourable living conditions, and prevailing wind direction. Benefits such as protection from heat and moisture dissipation were sought.
- **Building Distance:** Narrow street spaces increase the prevailing wind speed in the streets, allowing moisture to dissipate. The close proximity of the buildings arose to meet the need for shading in the courtyards and the need for privacy.
- **Building Orientation:** The building orientation was chosen to align with the prevailing wind direction. The prevailing wind direction was chosen to dissipate moisture in hot and humid climates.

3.1.2. Evaluation of the Plan Type Characteristics of Pre-Earthquake Antakya Houses in Climatic Context

Prior to the February 6, 2023, earthquake, Antakya's settlement pattern continued to be influenced to some extent by traditional urban planning in terms of adapting to climatic conditions. However, during the period between the August 17, 1999, earthquake, centred in Gölcük and significantly impacting Türkiye (Turkey)'s building stock, and the similar earthquake of February 6, 2023, the influence of climatic factors on the construction process gradually weakened.

- **Building Location Selection:** Areas located between the Asi River and Mount Habib-i Neccar are preferred, and urban development expands haphazardly outside these areas.
- **Building Distance:** Disjointed and adjacent settlements are common, and the number of mass housing developments is increasing to meet the housing needs of the growing population. Conversely, the use of courtyard plan typology is decreasing.
- **Building Orientation:** Building orientations are often determined randomly or unconsciously, and rapid population growth leads to climatic factors being overlooked in planning.

New buildings constructed in the pre-earthquake period generally consume high energy, have inadequate thermal insulation, and limit natural ventilation. The positioning of windows and the types of materials used in reinforced concrete structures make it difficult to utilize natural wind currents; this has led to a departure from traditional building styles in terms of maintaining climatic balance in interior spaces [1, 10]. This situation can be attributed to rapid population growth and the need to create quick and cost-effective shelters to meet increasing demands. However, location selection and orientation also prioritized responding to increasing demands.

<u>3.1.3. Evaluation of Plan Features of Post-Earthquake Antakya Houses in Climatic Context</u>

Post-earthquake Antakya residences are being planned and constructed in accordance with current living standards and taking into account climatic conditions. Inspired by traditional Antakya houses, new plan types are being developed that adapt to modern architecture and living requirements.

- **Building Location Selection:** Not every parcel used as living space before the earthquake has been repurposed. Based on the city's development and post-earthquake analyses, settlement planning is being implemented in suitable areas around the Asi River.
- **Building Distance:** Detached, attached, and courtyard building blocks continue to be used.
- **Building Orientation:** Building orientations are determined based on criteria such as temperature control and prevailing wind directions. This fosters conscious, climate-compatible design choices.

The sample plan types adopt design approaches that address the question of whether the continuous organic fabric of old Antakya streets and the life that developed within the courtyard layout of the houses that comprise this fabric can be recreated on a different scale (Figures 3 and 4).

Fig. 3. Planned Building Block

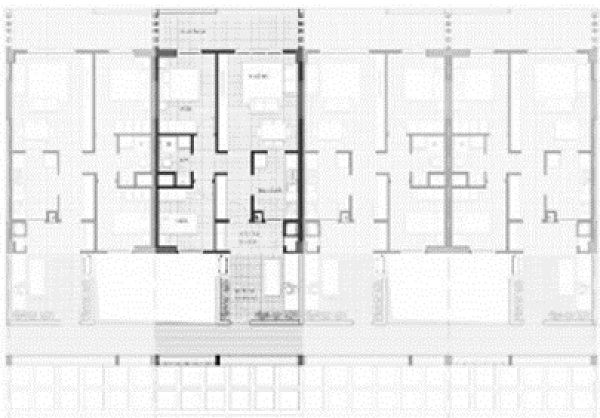


Fig. 4. Planned Housing Example [17]

The plan diagrams in Figures 3 and 4 reveal traces of a traditional housing plan typology. The courtyard plan, organic layout within the building block, and interior layout solutions reflect a return to traditional housing patterns.

3.2. Evaluation of Facade Features in a Climatic Context

Facade features stand out as a determining factor in the adaptation of buildings to climatic conditions. In hot and humid climates, facade design can improve energy efficiency by regulating the temperature and humidity balance of the interior space, or it can negatively impact this adaptation due to unconscious planning choices. This section covers the facade features of the three periods discussed in this study.

<u>3.2.1. Evaluation of Facade Features of Traditional Antakya Houses in a Climatic Context</u>

Regional and climatic factors influence the selection of materials used in buildings. Materials obtained from natural resources in the region and suitable for use in construction significantly influence the formation of traditional buildings. Furthermore, design approaches appropriate to climatic conditions are developed to the extent that the building materials allow. The facade features of traditional Antakya houses have been shaped by different design approaches to adapt to the city's climate (Figures 5 and 6).


Fig. 5.


Fig. 6.

Facade Characters of Traditional Antakya Houses [18]

- **Fullness vs. Space:** Windows in traditional houses are narrow and high; this design prevents direct sunlight from entering the interior while also being placed diagonally to benefit air circulation. Windows facing the exterior are narrow and few in number. The diagonal placement of the windows was designed to take into account the wind directions surrounding the house, thus ensuring continuous air circulation within the interior.
- **Building Envelope Section:** Breathable local materials; thick stone walls, and the use of wood and stone in some buildings are observed.
- **Shading Elements:** In hot, humid climates, protection from the sun and reducing the effect of heat guide the facade design approach. The close placement of buildings and the use of shade trees in courtyards, creating a well-like effect, provide protection from the sun. In some traditional buildings, sun control is achieved through shutters.
- **Thermal Insulation:** Thick stone walls are an important feature of the facade character of traditional houses. In summer, these walls prevent heat from entering the house while maintaining a cool interior at night. In this way, it helps to provide a cooler environment indoors.

<u>3.2.2. Evaluation of Facade Characteristics of Pre-Earthquake Antakya Houses in a Climatic Context</u>

The materials used in buildings change over time; production efforts to meet the housing needs of the growing population are being accelerated by technological advancements. In this process, rapid and unregulated urbanization has resulted in the emergence of multi-story reinforced concrete structures. Multi-story reinforced concrete construction directly affects facade characteristics and weakens the harmony with the traditional texture.

- **Fullness – Emptiness:** Windows are opened without regard for building orientation and ventilation.
- **Building Envelope Section:** Thinner wall sections have created multi-layered wall sections for insulation purposes.
- **Shading Elements:** Shading is provided by tension elements such as tarpaulin and sunshades.

- **Thermal Insulation:** Depending on the conditions of the period in which they were built, buildings are constructed with insulating materials or plastered walls without insulation.

The multi-story, attached residential structure with varying heights and number of floors, located on Block 5 of Cumhuriyet Street before the earthquake, is seen in Figure 7. It is far removed from traditional residential patterns and does not reflect a design approach appropriate to climatic conditions.

Fig. 7. Multi-Storey Housing on Block 5 of Cumhuriyet Street before the Earthquake [17]

3.2.3. Evaluation of Facade Characteristics of Antakya Houses in a Climatic Context After the Earthquake

Antakya, which experienced extensive devastation after the earthquake, has begun rebuilding with more conscious and climate-adapted designs. Reinforced concrete construction, which directly affects the facade character, is being addressed as a design challenge, resulting in the emergence of a "convergence of traditional and modern construction."

- **Fullness – Emptiness:** Windows are planned to ensure interior comfort, taking into account the building's orientation and usage.
- **Building Envelope Section:** Multi-layered walls appropriate for the year of construction are being used.
- **Shading Elements:** Considering the sun's orientation and the facade, elements such as sunshades and other elements have begun to be used in the design.
- **Thermal Insulation:** Insulation materials are being used appropriate to the conditions of the period in which they were built.

Daylight and air circulation are provided through the courtyard. In a climatic context, this is embodied by the presence of a fountain in the courtyard that serves as a cooling feature, the presence of shade-providing trees, and the support of natural ventilation and air circulation through windows positioned diagonally between floors [4]. As seen in Figures 8, 9, and 10, the return to the courtyard plan scheme reveals a modern interpretation of traditional elements in the facade characteristics. Modern materials were preferred in terms of material use.

3.3. Evaluation of Structural Features in a Climatic Context

Buildings designed in harmony with the climate contribute to energy efficiency. In hot and humid climates, the selection of appropriate building materials and insulation techniques reduce heating and cooling costs while preventing moisture from damaging the structure. This section analyses the structural characteristics of Antakya houses during traditional, pre-earthquake, and post-earthquake periods.

3.3.1. Evaluation of the Structural Features of Traditional Antakya Houses in a Climatic Context

Antakya is a city distinguished by its traditional structures made of stone, adobe, and wood [4]. Structural features of traditional Antakya houses, such as thick stone walls and the extensive use of wood, prevent hot drafts in the summer months, keeping interior spaces cool. Breathable walls support natural ventilation, thus ensuring air circulation within the spaces.

Fig. 8. Cumhuriyet Street Block 5 Building Proposal After the Earthquake, Internal Volumes

Fig. 9. Cumhuriyet Street Block 5 Building Proposal, External View [17]

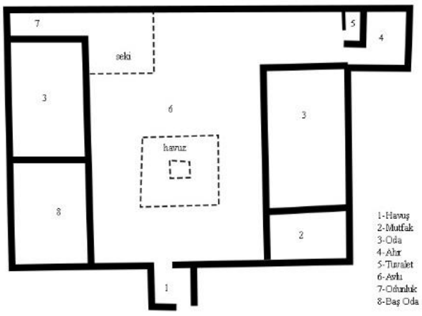


Fig. 10. Plan scheme of a traditional Antakya house (redrawn and adapted from Çelebi, 1982) [4]

Two main types of structural systems are seen in the single- or two-story Antakya houses that have survived to this day:

- Masonry system: The entire structure is constructed of stone.
- Masonry stone on the lower floor and stone infill between timber framing on the upper floor: Bay windows are generally used on the upper floor. Compared to the masonry system, the typology of masonry stone on the lower floor and stone infill between timber framing on the upper floor is more widely used [9]

• Number of Storeys: Single or two-story housing types are widely used in traditional Antakya settlements. This height provides harmony with the neighbourhood's texture in terms of both climatic adaptation and building scale.

• Roof Type and Material: Antakya, located in a hot and humid climate zone, periodically receives high amounts of rainfall. Therefore, the eaves of traditional houses are kept long to allow for controlled rainwater drainage. Rainwater directed from the roof reaches runoff channels located in the middle of the stone-paved paths and is drained into the Asi River through these channels. This ensures both rapid drainage of water and urban-scale water management.

• Settlement Density and Situation: The design of the houses, particularly with interior courtyards and large window openings, allows for natural light and air circulation, creating a cool environment in summer and a warm one in winter.

• Construction: Stone provides coolness in summer and helps retain heat in winter. Wood, with its lightweight and elastic structure, provides both thermal insulation and creates a suitable environment for natural ventilation in interior spaces.

3.3.2. Assessment of Structural Characteristics of Pre-Earthquake Antakya Houses in a Climatic Context

From the second half of the 20th century onward, cities entered a period in which reinforced concrete construction became widespread. The use of concrete became widespread to meet the housing needs of the growing population.

• **Number of Storeys:** Multi-story settlements were constructed on high floors on unsuitable ground without proper soil surveys.

• **Roof Type and Material:** The use of hipped roofs is common.

- **Settlement Density and Location:** The unauthorized and unregulated expansion of mass housing to meet the housing needs of the growing population has led to unplanned urbanization and its accompanying problems.
- **Construction:** Concrete, unlike traditional buildings, is a material with low heat and air flow. This causes interior spaces to overheat in the summer and lose heat rapidly in the winter. The low moisture-holding capacity of reinforced concrete structures leads to moisture accumulation in interior spaces, especially in the winter. Concrete's high thermal conductivity has led to buildings overheating in summer and cooling in winter. Insulating materials are rarely used.

While courtyard-style designs in traditional buildings provide shade and help cool down on hot summer days, courtyard-style designs are generally absent in reinforced concrete structures. This has weakened climate-responsive design.

3.3.3. Evaluating the Structural Features of Post-Earthquake Antakya Houses in a Climatic Context

The structural features of post-earthquake Antakya houses are being reshaped to adapt to climatic conditions and increase earthquake resilience. Antakya houses, rebuilt to consider the effects of the hot and humid climate, prioritize climate-compatible features such as thermal insulation, natural ventilation, and moisture control. Providing both safety and climatic comfort is crucial in post-earthquake houses [5,6].

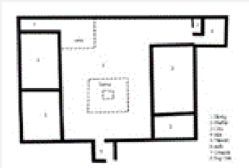
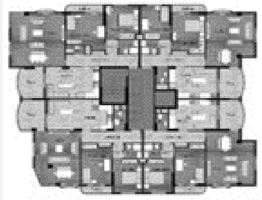
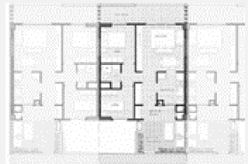
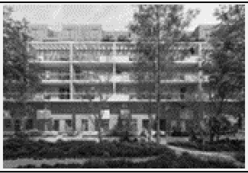
- **Number of Storeys:** Ground surveys have been conducted, and examples of multi-story construction have begun to be implemented on stable, low-rise, and stable foundations. Soil improvement methods are being used in the groundwork.
- **Roof Type and Material:** Hip roofs continue to be predominantly used.
- **Settlement Density and Location:** Although lived in mass housing areas, the need for open space was recognized during the earthquake, and the use of courtyard-based building blocks, suitable for modern living, has increased.
- **Construction:** Highly durable materials such as concrete and steel are preferred.

4. Findings and Discussion

The study examined the impact of structure and settlement on Antakya's history, both before and after the February 6, 2023, earthquake. The effects of hot, humid climate data on structure and settlement on the city and its construction patterns were observed during different periods. The research parameters are presented in a table. Accordingly, the building's location selection, in terms of plan typology, was spread across the area where traditional structures were limited, including areas unsuitable for construction in the pre-earthquake period to accommodate the increasing population and demand. While the distance between buildings was typically courtyards and narrow streets in traditional settlements, courtyard settlements were relegated to the background before the earthquake, but after the earthquake, proposals for courtyard-based construction began to be developed, along with both detached and attached layouts.

While traditional building orientations were designed to create a shading effect to protect from sunlight, arrangements were developed in the pre- and post-earthquake periods to allow daylight into the building. While the solid-void structure in traditional houses facilitated air circulation in the pre-earthquake period, these features evolved into modern facade appearances. However, traditional facade features were reinterpreted in the post-earthquake reconstruction process. Local materials were preferred in traditional buildings for building envelopes, achieving breathable interior spaces. Multilayered and processed materials were used in the pre-earthquake and post-earthquake periods. Consequently, the healthy building form in traditional buildings was replaced by processed materials. Shutters, used for sun protection and privacy in traditional buildings, were replaced by tarpaulin-like tension elements in the pre-earthquake period, while this approach was implemented in new construction after the earthquake using elements appropriate to modern design. In terms of structural features, low-rise, mostly masonry stone houses in traditional buildings gave way to multi-story reinforced concrete frame construction and brick wall construction. The use of steel to increase earthquake resistance and flexibility is also evident in new construction. Because there has been no significant change in climate conditions, roof types have been hipped roof in both traditional housing and buildings constructed before and after the earthquake.

Table 1. The analysed design criteria and comparative data were prepared by synthesizing the findings obtained from the studies [1, 4, 9, 15]

Comparative Analysis of Traditional, Pre-Earthquake and Post-Earthquake Building Characteristics				
	Design Criteria	**Traditional Antakya Houses**	**Pre-Earthquake Antakya Houses**	**Post-Earthquake Antakya Houses**
Plan Typologies				
	Location Selection	Between the Asi River and Habib-i Neccar Mountain	Antakya surroundings and suitable areas	Antakya surroundings and suitable areas
	Distance Between Buildings	Courtyard settlements, narrow streets	Separate and adjacent order	Detached, attached and courtyard building blocks
	Orientation of the Building	Positioning according to the dominant wind direction	Benefit from solar radiation + Positioning according to the prevailing wind direction	Benefit from solar radiation + Positioning according to the prevailing wind direction
Facade Features				
	Fullness - Emptiness	Narrow and small windows	Randomly opened window and door gaps	Suitable for indoor air circulation
	Building Shell Section	Breathable local materials, thick walls-single layer	Layered thin walls - multi-layered, suitable for the year of construction	Layered thin walls - multi-layered, suitable for the year of construction
	Shading Elements	Traditional wooden shutter system	Tarpaulin etc. elements	Design-appropriate elements
	Heat insulation	Thick stone wall with high thermal mass	Insulation materials	Insulation materials
Constructional Features				
	Number of Floors	1 or 2	Multi-storey	Max. 4
	Roof Type and Material	Hipped roof	Hipped roof	Hipped roof
	Settlement Density and Positioning	Courtyard-centered, adjacent building blocks	Attached and detached apartment blocks - detached houses	Courtyard island typology
	Construction	Masonry and wood	Reinforced concrete (weighted)	Reinforced concrete or steel

5. Conclusion and Recommendations

The study examines the effects of hot and humid climate conditions on building and settlement using the example of Antakya, revealing the historical development of climatic conditions in settlement planning and construction processes. Antakya's hot and humid climate directly shaped traditional housing designs, prioritizing climate-compatible design parameters such as natural ventilation, thermal insulation, and appropriate material selection.

In the pre-earthquake period, apartment-type mass housing became widespread in response to the housing needs brought on by rapid population growth; climatic parameters were largely ignored during this process. In post-earthquake construction activities, modern construction materials such as concrete and steel were preferred to increase resistance to seismic loads. However, this led to the weakening of climatic adaptation elements such as natural ventilation and thermal insulation.

In conclusion, the Antakya example demonstrates that achieving the balance between earthquake-resistant building design and climatic adaptation is critical for future construction processes. A sustainable design approach sensitive to climatic factors is considered a fundamental requirement for both environmental and structural sustainability.

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