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Evaluation of Urban Renewal Projects in the Historical Texture Within the Framework of Passive Design Strategies; A Case of Diyarbakır-Suriçi Alipaşa-Lalebey Neighborhood

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Abstract

In the 21st century, contemporary architectural designs have often overlooked the interaction between constructed structures and their natural environment, neglecting to consider climatic variables as essential design inputs. This oversight, coupled with the rising threats of climate change and extreme weather conditions, has compromised the comfort and well-being of occupants within these spaces. A shift towards different design paradigms has become imperative to address these challenges and build a sustainable future. Diyarbakır traditional urban fabric has conserved its authenticity in social, cultural, and environmental contexts up to the present day. However, the migratory movement's social and cultural developments have disrupted the original fabric, resulting in deteriorating areas over time. This study focuses on the traditional settlement pattern within the historical Suriçi and Alipaşa-Lalebey Neighborhood, where the Urban Transformation Project was completed, was chosen as the case area. To analyze the changes in building patterns, spatial relationships, parcel configurations, and transformations in courtyard-street structures, Geographic Information System (GIS.)-based ArcMap software is employed. Digitized data, on-site observations, and photographic documentation are used to compare urban and neighborhood units in terms of climate-responsive design strategies and passive cooling systems. This study underscores the importance of incorporating climate-responsive design approaches from the past while utilizing contemporary technological advancements, emphasizing the significance of technologies such as Geographic Information Systems (GIS), which contribute to energy conservation and time efficiency during the reconstruction processes. The findings of this study demonstrate that alterations in building patterns, shifts in solid-empty relationships, and changes in street patterns not only lead to the loss of cultural heritage but also hinder the transmission of numerous geographically specific design approaches to future generations.

Keywords:
Climate-responsive design, Geographic Information System (GIS), Passive cooling strategy, Traditional Suriçi urban fabric.

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INTRODUCTION

Global warming and climate change have emerged as significant challenges of the Anthropocene era. According to the World Resource Institute, 64.5% of global anthropogenic greenhouse gas emissions originate from the energy sector (World Resource Institute, 2014). Population growth, efforts to meet modern living standards, and changing consumption habits have begun to impact the energy consumption dynamics of buildings within urban environments. According to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, if greenhouse gas emissions remain at current levels, global temperature increase could exceed the target value of +1.5°C set by the Paris Climate Agreement, reaching over +3°C (Masson-Delmotte, 2021). Given these future scenarios, it is imperative to develop design approaches focusing on existing cities and architecture (Groot et al., 2015; Van Hooff et al., 2015). The increase in outdoor temperatures is expected to lead to a differentiation in heating-cooling demands in the construction sector, accelerating energy consumption (IPCC, 2014). Extreme weather events are anticipated to affect human activities, daily life, thermal comfort, building production patterns, and the construction industry. In other words, global climate change and temperature increases are expected to impact thermal comfort perception and human health (Baharun et al., 2020).

This framework considers initiating climate change mitigation strategies from the construction sector a rational approach. Sustainable architectural approaches that effectively utilize energy and reference renewable energy sources have become necessary for optimizing the natural environment (Semahi, 2019). Climate-responsive design, an approach used in local and traditional architectural examples, significantly reduces energy demand in buildings without compromising modern living standards (Bodach et al., 2015). Traditional architecture has incorporated traces of climate-responsive design strategies since ancient times (Vatan Kaplan, 2019). The fundamental principle of climate-responsive design is optimizing building environmental performance by evaluating climatic parameters (Piquer, 2003; Topfer, 2009; Zare & Ghanberi, 2022). The environmental comfort of users experiencing the building depends on their adaptation to climatic factors such as wind and sun (Motealleh et al., 2016). Traditional architecture can be considered significant built environment resources that carry traces of climate-responsive design strategies. Considering local climatic data, design parameters and outputs at both the neighborhood unit and single-building scales have been created. Therefore, traditional architecture is crucial in sustainable and climate-responsive architecture (Zare&Ghanbari, 2022).

Traditionally developed architectures have been formed through living and experiencing building techniques and features. Local architecture brings different solutions and approaches to climatic constraints (Rakoto-Joseph et al., 2009; Soleymanpour et al., 2015). In

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this context, Historical Diyarbakır City, Suriçi known as the city's first settlement, contains climate-responsive design components such as compact urban form, mixed land use, pedestrian-focused transportation solutions, and specific structural characteristics. Over time, migrations to the region and uncontrolled illegal constructions have disrupted the traditional urban fabric. This study focuses on the traditional urban fabric of Diyarbakır's Sur Neighborhood. It selects the Alipaşa-Lalebey Neighborhood, where an Urban Renewal Project was initiated in 2015, as the study area. The reconstruction process initiated in the Alipaşa-Lalebey Neighborhood aims to design new living spaces compatible with the historic environment. To ensure the sustainability of the original characteristics in new housing structures, the Conservation Development Plan was revised in 2016, and urban renewal projects were aimed to be designed in line with this plan. In this study, the ArcMap program was selected to digitize and compare the fabric losses in urban blocks, solid-void relationships, and changes in block-parcel-street patterns. Digitized data was combined with on-site observation, photography, to compare urban and neighborhood units regarding climate-responsive design strategies and passive cooling systems.

This study aims to emphasize the importance of using technologies such as the Geographic Information System (GIS), which takes into account climate-responsive design approaches from past to present while using energy-saving and sustainable design strategies in the reconstruction processes of historical patterns and also contributes to time-saving by following current technological developments in this process. In the first step of the study, using the ArcMap program, the sizes of the urban blocks in five regions in Alipaşa-Lalebey Neighborhood, where the Urban Renewal Project was completed, were compared with the conservation development plan.

As a result of the digitization, the second region, where the relationship between parcel-urban blocks was altered by dividing it with road axes, was selected. The fabric losses in the urban block of the second region and their effects on building-parcel-block relationships, solid-void ratios, and urban block-parcel-street configurations were digitized using the ArcMap program and compared with the Conservation Development Plan. Within the framework of all numerical data, the impact of changes in urban block rates, solid-empty percentages, and urban block-parcel-street pattern on passive cooling strategies was examined due to urban transformation.

The study revealed that the narrow streets, characteristic features of the historic fabric, were widened as part of the urban renewal project. These changes will reduce shadow effects between buildings, leading to the warming of facade surfaces and a decrease in internal thermal comfort. Additionally, this change in street widths was considered to harm pedestrians experiencing the street in their daily life practices, decreasing outdoor thermal comfort. The increase in the solid surface is expected to lead to an increase in the urban heat island effect due to the lack of application of another passive cooling design strategy. Urban form, functions of urban blocks, mixed land use, dead-end streets, and other climate-responsive design components have remained unchanged, adhering to the original fabric within passive cooling strategies.

This study demonstrated that if passive cooling strategies such as shading, wind, and landscape are not sufficiently utilized, thermal comfort in both indoor and outdoor spaces may decrease. In this context, it was emphasized that a design approach incorporating climate-friendly and passive systems that consider current needs and conditions should be adopted in renovating a historic fabric.

This study has proven that the loss of urban blocks in the traditional pattern, the change in solid- void relationship, and the differentiation of street patterns will lead to the loss of cultural heritage and cause many characteristic design approaches specific to the geography not to be transferred to future generations. The unique value of this study is that it is the only study that examines in detail the large-scale reconstruction process of a historical pattern in the 21st century and examines it on the scale of passive design strategies using quantitative and qualitative research techniques.

This study shows how the use of computer-based technologies, such as Geographic Information Systems, can be integrated into rapidly digitizing and mapping spatial transformations and changes to guide the management of similar projects in the future. In addition, the necessity of passive design strategies for the adoption of energy-saving, sustainable, and integrated design approaches in the reconstruction processes of the historical fabric is also emphasized in this study. In addition, choosing the GIS-based ArcMap program within the scope of the study shows that time can be saved using technological methods and can contribute more effectively to the conservation and reconstruction processes of future historical patterns. This study has shown that it is possible to create energy-efficient urban blocks and street pattern by integrating today's advanced technologies into climate-responsive design approaches.

LITERATURE REVIEW

Climatic events such as sun, wind, and rain are essential parameters that direct the design of the built environment from the past to the present. There are different approaches in which natural environmental parameters are included in the design by developing different design approaches within the framework of climatic variables. In his study published in 1989, Hasting expressed the way a building interacts with external environmental climatic conditions as climate-insensitive, climate-combative design, and climate-responsive design approaches (Figure 1).

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With Climate-Insensitive Design there is no interaction with the environment at all. The building operates indifferent from the climate it is set in. With such buildings most of the interior spaces have no direct contact with the outdoors and building services are provided mechanically.

With Climate-Combative Design the building 'fights' the outdoor environment, mainly through super-insulation. The building design does take local climate into account while it sets for the initial amount of insulation needed.

With Climate-Responsive Design the building acts as an environmental filter. A balance is found between the exclusion of unwanted forces and the admittance of the beneficial ones.

Figure 1. Building interacts with environment in three different ways

Although the climate-responsive design approach was included in the literature in the 20th century, it has survived from ancient times to the present day with different examples on an urban and architectural scale (Panarelli et al., 2016; Vatan Kaplan, 2019). The comfort of the user who experiences the building depends on its adaptation to climatic factors such as wind, sun, and rain. In this context, climate-responsive design helps the building user provide maximum comfort by aiming to reduce the consumption of energy resources to a minimum level (Motealleh et al., 2018). Parameters such as the location of the building, its orientation, the positions and distances of the buildings relative to each other, the building form, shell, and thermophysical properties are among the essential parameters affecting energy conservation and indoor thermal comfort at the building scale (Manioğlu & Yılmaz, 2007; Saraydar; 2015; Sami, 2021).

Climate-responsive design is based on the principle of creating the built environment by considering the environmental dynamics of the region. In other words, climate-responsive design strategies aim to save energy in the summer and winter periods by providing solutions that will increase solar radiation in the winter period and design strategies that will reduce solar radiation in the summer (Olgyay, 1963; Pour, 2011; Almatarneh, 2013; Yang, 2022). Turkey has a rich cultural heritage based on traditional architecture and has five different climate zones. The adverse effects of the climate, especially in hot-dry regions, have been tried to be eliminated with traditional construction methods and experiences. As a result, unique local architectural patterns have been formed in cities. The southeastern Anatolia Region has a desert climate with a high-temperature difference between day and night. Traditional buildings built in this region, where the highest solar radiation is observed, provide passive thermal comfort in the interior by controlling the climatic conditions (Erdemil et al., 2016; Manioğlu & Koçlar Oral, 2012; Manioğlu & Yılmaz, Z, 2007).

The climate-responsive design approach includes different construction techniques according to climatic effects. Climate-responsive

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design approaches according to hot-dry climate regions on an urban scale are shown in Table 1. Human and natural parameters such as narrow streets, neighborhood units, urban form, open-semi-open areas, topography, and urban heat island, which include urban design and its sub-parameters, are used as climate-responsive design parameters (Abanomi & Jones, 2005; Saraydar; 2015; Peker, 2016; Forouzandeh, 2018; Han et al., Kaihoul et al., 2021; 2023; Salameh et al., 2023).

Table 1. Climate-Responsive Design approaches in hot-dry climate regions at urban scale (Abanomi ve Jones, 2005; Saraydar; 2015; Peker, 2016; Forouzandeh, 2018; Han vd., Kaihoul vd., 2021; 2023; Salameh vd., 2023)

Climate Responsive Design Approaches at the Urban Scale Urban Form	
Urban Form	• Narrow streets • Compact urban form • Shaded volumes can be created with columns, arcades, overhangs, and cantilevered building components. • Membranes and small closed courtyards are traditional solutions in climate-sensitive design approaches.
Open-Semi Open Areas	• Small or medium-sized green open areas should be created. • Walking distance to public areas should be minimal. • Access to public areas should be provided from shadow areas. • Green areas or recreational areas should be created in areas where streets meet.
Topography	• Shaded areas can be provided with natural topography (Tercing). • High altitudes and places with the possibility of evaporation are advantageous for urban settlements.
Heat Sinking Surfaces Urban Heat Islands	• Heat sinks such as seas, lakes, and forests will create more excellent areas on a city scale. • Fountains and ponds are among the effective air conditioning systems at more minor scales. • To reduce the urban heat island effect, It is necessary to reduce the use of hard ground such as concrete and asphalt.

Passive design strategies provide requirements such as heating, ventilation, air conditioning (HVAC), hot water production, and lighting without using energy systems (Foster, 2021). In other words, they are systems that optimize indoor comfort conditions without the need for artificial forces such as mechanics or electricity. Passive design strategies vary depending on the region's climatic conditions (Almatarneh, 2013). In hot, dry climate regions where the hot period lasts longer than the cold period, urban design approaches must be considered together with the physical environmental context. Urban design configurations in hot, dry climate regions directly impact energy use. Street pattern, green areas, and vegetation, landscape elements shape the microclimatic characteristics of the region (Fahmy & Sharples, 2009a; Mirzaei & Haghighat, 2010; Galal et al., 2020; Mahmoud et al., 2021; Fahmy et al., 2022).

Neighborhood unit and street pattern, which are among the urban design sub-components, significantly impact outdoor climatic comfort. When realizing passive design solutions in the context of neighborhood units in hot, dry climate regions, it is possible to provide thermal comfort by using the shadow effect, orientation and width of street canyons, urban density, and form, afforestation, and green infrastructure, and horizontal and vertical solar control elements (Figure 2).

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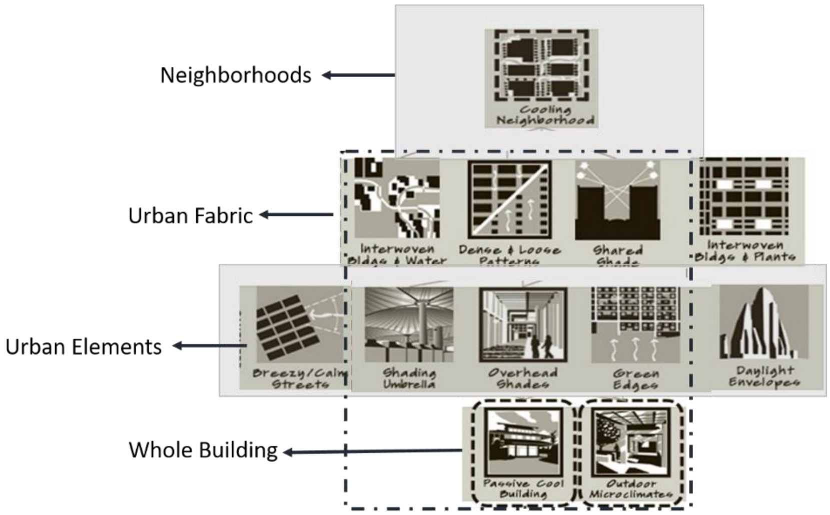

Figure 2. Passive cooling system in the context of neighborhood unit (Dekay & Brown, 2014)

Many studies in the literature address passive cooling system parameters at different scales. In this context, studies addressing the effect of passive design strategies on thermal comfort on an urban scale are one of them.As a result of the study carried out in Egypt to examine the effect of open space design and urban configuration on façade temperature proved that the urban configuration that effectively reduces solar radiation has a clustered city form (Bahgat et al., 2020). Additionally, the effect of residential courtyards in the city of New Assiut in Egypt on outdoor thermal comfort was examined, and it was proven that the P.E.T. value could be reduced up to 17°C in the scenario where the appropriate tree species and shading element were used together (Abdallah & Mahmoud, 2022). Another study on an urban scale was to investigate the effect of shadow effect on thermal loads in high-density urban areas in hot-dry climate regions. As a result of this study, it was determined that thermal loads decreased by 16-18% due to the shadow effect (Lima et al., 2019). Another study on urban form, conducted in a hot-dry climate region, proved that the compact urban form increases thermal comfort by reducing solar radiation falling on pedestrian paths (Alznafer, 2014). In hot-dry climate regions, courtyards provide thermal comfort due to the shade effect.

In this context, as a result of the study carried out on the courtyard building form, which helps to reduce annual energy consumption with passive cooling techniques in the hot-dry climate region, it was concluded that annual energy savings can be achieved if the courtyard form is integrated into today's housing sector (Ayçam et al., 2020; Hatipoğlu&Mohammad; 2021). Another study on courtyard form and layout determined that annual energy loads would decrease when a shadow effect was created by creating appropriate form and building density (Ayçam & Varshabi, 2016). In studies on street pattern and orientation of passive cooling strategies in hot-dry climate regions, it has been determined that North-South (N-S), NE-SE, and NW-SE directions are optimal, and these directions have a positive effect on providing thermal comfort (Jamei & Rajagopalan, 2019). The effective use of the shadow effect, which is a passive cooling criterion on an urban scale, in the context of the neighborhood unit and street pattern, also varies depending on the type and thermal properties of the floor coverings used in the streets and avenues in urban areas. In this context, in the study conducted to examine the effect of flooring materials on thermal comfort, it was determined that surface temperatures reached up to 60 ◦ C if coating materials such as cement, concrete, and high asphalt mixtures were used as flooring (Santamouris et al., 2001; Xu et al., 2019).

To summarize, creating a shadow effect by increasing height/width (H/W) ratios in hot, dry climate regions (Fahmy, 2022; Muniz-Gaal et al., 2020; Yıldırım, 2020), developing green areas and infrastructure systems (Kenawy et al., 2010; Bekleyen ve Melikoğlu, 2021). ; Lowe, 2016; Dwiputra, 2021; Al-Kubaisy, 2022; Najah, 2023), using urban surfaces and water elements with different thermal properties (Peng et al., 2019; Ferrari et al., 2020), orientation of canyons and streets in the north-south direction, use of courtyards, compact city form (Ahmadi et al., 2022; Zhang et al., 2023; Sözen et al., 2019; Ridha, 2017; Abaas, 2020; Abaas & Khalid, 2023).

When all studies were examined, it was determined that many studies were carried out on the shadow effect, which is among the passive cooling criteria. It has been proven that indoor and outdoor thermal comfort can be achieved through the shadow effect, without relying on mechanical or electrical systems, if the street pattern and orientation, courtyard form, and appropriate landscaping elements are used. Another critical issue on which studies have been carried out is the thermophysical properties of the building materials due to the heat island effect. These studies have shown that it is possible to provide thermal comfort both indoors and outdoors if passive design strategies on an urban scale are considered together with appropriate climatic features specific to the location. No study has been found in the literature that addresses the urban renewal process in a historical pattern with passive cooling strategies. In this context, no comprehensive study currently examines the impact of urban transformation in the Diyarbakır Suriçi region on passive design systems. No scientific source digitizes this transformation in the traditional urban pattern on the scale of urban block, solid- void percentage, and building-parcel-street pattern and compares it with the old urban pattern. In this context, the Suriçi region was taken as the study area on the UNESCO Cultural Heritage list and stood out with its cosmopolitan structure throughout history .

As a result of this study, it has been shown that the loss of urban blocks in the traditional pattern, the change in solid-void relationships, and the differentiation of the street pattern will both lead to the loss of cultural heritage and cause many characteristic design approaches specific to the geography not to be transferred to future generations. The unique value of this study is that it is the only study that examines in detail the large-scale reconstruction process of a historical pattern that

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took place in the 21st century and addresses it at the passive design strategy scale using quantitative and qualitative research techniques. This study shows how the use of computer-based technologies, such as Geographic Information Systems, can be integrated into rapidly digitizing and mapping spatial transformations and changes to guide the management of similar projects in the future. The study underlines the requirements and importance of passive design strategies for adopting energy-saving, sustainable, and integrated design approaches in the reconstruction processes of the historic fabric.

RESEARCH MATERIAL AND METHOD

Geographic Information Systems (GIS) based ArcMap program was used as study material. This software program combines storing, analyzing, and collecting data (Jin et al., 2023). The acceleration of the urbanization rate in the 21st century is reflected in spatial analysis technologies. Recent studies on public spaces have used GIS based spatial analysis methods and quantitative methods that include numerical data. (Jiang 2010; Chen, 2021). The main class of GIS data is coordinate data, which contains geometric data and reflects spatial dimension. Large amounts of data are used to create facts. GIS may differ depending on the intended use. GIS supports resource and land management, urban design, transportation, risk analysis, and other spatial features (Haydarovich et al., 2023). With the help of Arcgis, analyses such as spatial analysis, digitization, mapping, and remote sensing can be performed.

GIS evaluates information from a broad perspective, such as transportation networks, land use, and demographic data in urban design, and evaluates this information spatially. In this context, the GIS-based ArcMap program, which realizes potential problems not noticed by traditional data analysis methods in a shorter time, was determined as the study material. This program was used to digitize and map the spatial change in the urban fabric of Suriçi. Using GIS-based ArcMap, the Conservation Development Plan (2016) and Urban Renewal Projects of the Suriçi urban fabric were mapped using ArcMap 10.8. In the first step of mapping, the program introduced the coordinate and projection systems of the Diyarbakır Suriçi region. The layers on the map were converted to GIS-based extensions and digitized.

Table 2. The climate-responsive design parameters evaluated within the scope of the study

Climate Responsive Strategies
Urban Fabric Scale
Compact Urban Form
Density Urban Form
Street Pattern Scale
Narrow Streets
Connected building
Arrangement of buildings according to the sun and wind direction
Courtyard-Street Relationship
Courtyard Design (Solid-Void Relationship, orientation)

The changes that occurred with the urban renewal project in the Suriçi city fabric, in other words, the boundaries, sizes, forms, and street characteristics of the urban block in the original pattern, were examined within the framework of the climate-responsive design approach. At the urban scale, a compact urban form and urban density were evaluated. At the street scale, climate-sensitive design strategies were employed, including narrow streets, courtyard solid-void relationships, and the placement of buildings based on sun and shadow effects (Table 2).

The method of the study is shown in Figure 3.

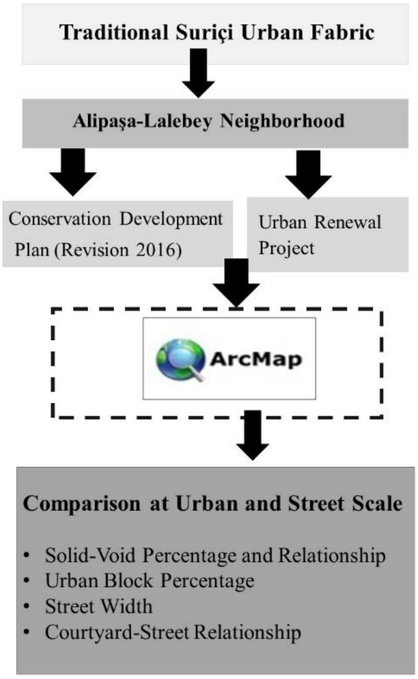

Figure 3. General Framework and Methodology of the Study

General Characteristics of the Traditional Suriçi Urban Fabric

Diyarbakır is located in the southeastern region of Turkey, on a broad plateau between Karacadağ and the Tigris River. The traditional Diyarbakır settlement pattern is located in the central part of Southeastern Anatolia, between Karacadağ Mountain and the Tigris River (38° 51' N, 40° 21'E), on the eastern slope of a basalt plateau (Darçın, 2020; Demir, 2021). Although the beginnings of the city's history are not sure, it is suggested that it is the period of the Hittites and Hurrians (3500 BC) (Beysanoğlu, 2003). Diyarbakır Historical Suriçi Region is surrounded by walls that are 5 km long and 6-8 m high (Baran et al., 2011). The Suriçi Region comprises 15 neighborhoods with north-south settlement patterns (Figure 4).

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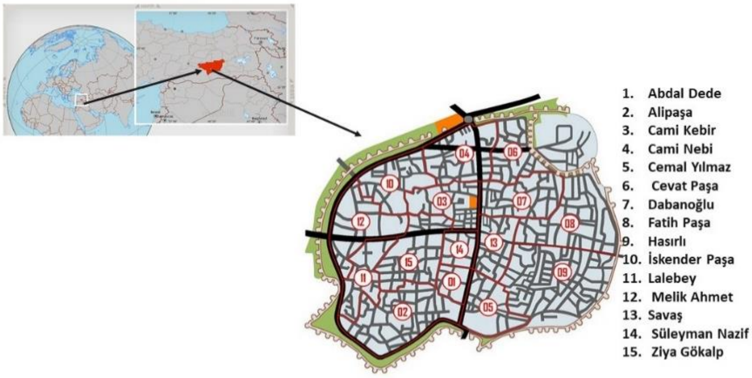

Figure 4. Suriçi Region location and neighborhood illustrations (Maphill, 2024)

According to the Köppen climate classification, the city of Diyarbakır has a dry summer Mediterranean climate (Csa) with hot and dry summers and rainy winters (Yılmaz & Çiçek, 2018). According to long-term data from the weather observation station in the city center, the annual average temperature was determined as 15.9 °C and the highest and lowest temperatures were 46.2 (July) and -24.2 (January). The annual sunshine duration is 7.5 (Table 3).

Table 3. Climatic Data for Diyarbakır City (Turkish State Meteorological Service, 2022)

Climate Period (1991-2020)													
	January	February	March	April	May	June	July	August	September	October	November	December	Anuel
Average Temperature (OC)	1.8	3.8	8.3	13.8	19.3	26.1	31.0	30.5	25.1	17.6	9.7	4.1	15.9
Average Highest Temperature (ºC)	6.7	9.2	14.5	20.5	26.6	33.6	38.4	38.3	33.4	25.4	16.3	9.2	22.7
Average Lowest Temperature (ºC)	-2.2	-1.0	2.5	7.0	11.3	16.6	21.7	21.1	16.0	10.1	4.2	-0.2	8.9
Average Sunshine Duration (hour)	3.9	4.9	5.6	7.2	9.6	12.2	12.4	11.7	10.0	7.5	5.5	3.9	7.9
Average Rainy Days	12.33	11.34	11.83	11.22	8.74	2.66	0.47	0.32	1.07	5.71	8.17	11.50	85.4
Measuring Period (1929-2020)													
The highest temperature (ºC)	16.9	21.8	28.3	35.3	39.8	42.0	46.2	45.9	42.2	35.7	28.4	22.5	46.2
The lowest temperature (ºC)	-24.2	-21.0	-14.0	-6.1	0.8	1.8	9.9	11.4	0.0	-1.8	-12.9	-23.4	-24.2

Case Area: Alipaşa-Lalebey Neighborhood

In 2008, an urban design project was prepared to end slum development within the scope of the "Diyarbakır Alipaşa and Lalebey Neighborhood Urban Renewal (Slum of Transformation) Project." The demolition process was stopped because most of the neighborhood's population did not accept the transformation. In the negotiations that started again in 2009, it was stated that Conservation Development Plan would be adhered to within the scope of urban renewal, and a conditional protocol was signed within this framework (Korkma, 2016). In 2010, within the scope of the İçkale Urban Transformation project, a protocol was signed with the Mass Housing Administration, and the transformation process started, albeit partially. In 2012, the urban transformation works were suspended after those residing in the Alipaşa-Lalebey Neighborhood did not leave their homes. In 2015, when the conflict process began, the Urgent Expropriation and Suriçi Urban renewal project started, based on the Disaster Risk Area Decision taken in 2012 (Yakut & Ceylan, 2019). Alipaşa-Lalebey Neighborhood is the first settlement where the urban renewal project started. After the expropriation decision in the areas to be demolished, demolition work started (İpek, 2020).

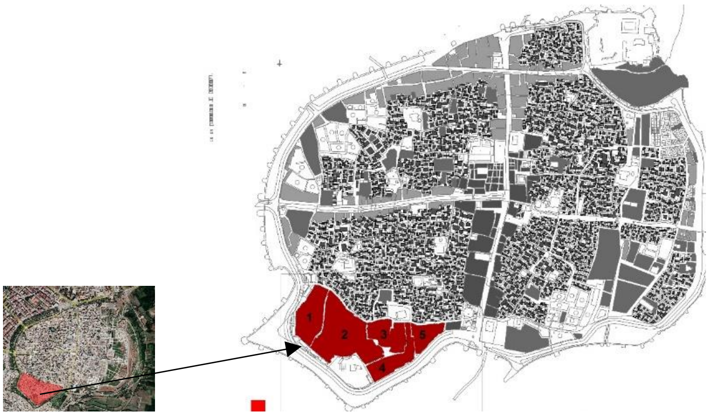

Figure 5. Diyarbakır Alipaşa and Lalebey Neighborhood Urban Renewal (Slum Transformation) Project (The map was recreated by the author using the city plan base taken from the Ministry of Environment, Urbanization and Climate Change)

In aerial photographs, changes in the original pattern are stated chronologically. Aerial photographs of urban transformation and before in Alipaşa-Lalebey Neighborhood are shown Figure 6. The reconstruction phase started in the southwestern part of the region (İpek, 2020).

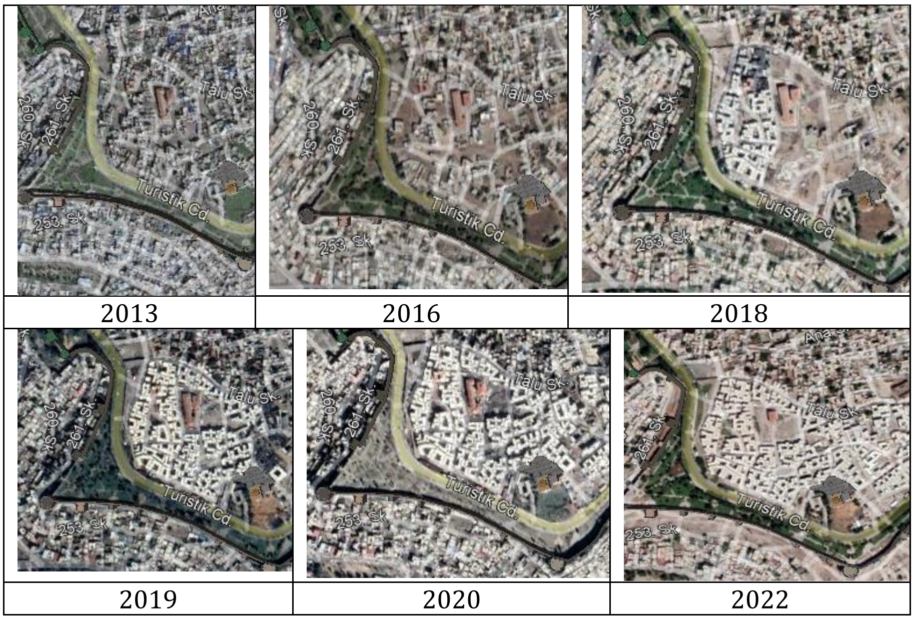

Figure 6. Change of Alipaşa-Lalebey Neighborhoods over the years (Aerial Image/Google Earth)

Alipaşa-Lalebey Neighborhood Urban Renewal Project was initiated by the Ministry of Environment and Urbanization. The housing construction projects in the Alipaşa and Lalebey neighborhoods, divided into five regions, were undertaken by five different contractors, as shown in Figure 5 and Figure 7 (Aslan & Dündar, 2022).

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Diyarbakır Alipaşa and Lalebey Neighborhood Urban Renewal (Slum Transformation) Project (Ministry of Environment, Urbanization and Climate Change, 2018)	Conservation Development Plan (2016 Revision)

Figure 7. Comparison of Diyarbakır Alipaşa and Lalebey Neighborhood Urban Renewal Project and Conservation Development Plan (Ministry of Environment, Urbanization and Climate Change, 2019)

EVALUATION AND DISCUSSION OF RESULTS

Alipaşa-Lalebey Neighborhood Urban Renewal Project and Conservation Development Plan (2016) were compared on the urban block size scale, and the changes in unit square meters were calculated using the Arcmap program. As a result of the digitizations carried out in the first region, 3-10% of pattern loss occurred in the square meters of the urban block. The most significant change in urban block size and boundaries occurred in urban block number 479. Increasing the road width to 7 meters to provide access to every point from urban block number 305 in the center caused an 8% pattern loss in this urban block. The change in urban block sizes within the scope of the urban renewal project in the second region is shown in Figure 9. Roads have been opened to ensure the continuity of transportation axes within the urban block. The urban block number 273, previously designed as a single-building urban block, was divided into two regions with 7-meter wide roads to ensure the continuity of the transportation axis and for emergency crossings, resulting in an 11% decrease in the square meter of the urban block (Figure 8).

The urban block number 274 is divided into three zones by 5-meter-wide roads passing through its center. There was a 10% decrease in the size of the urban block due to the increase in street width. The change in the urban blocks that occurred within the scope of the urban renewal project in the third region is shown. In the third region, street widths were increased from 3 meters to 5 meters in some areas. This change in the street pattern has caused a decrease in the size of the urban blocks by 3-13%. When the change in the borders of the urban blocks in the fourth region is examined, the road width in the urban block Number 267 has been increased to 7 meters in order to ensure the continuity of the transportation axis, which is located in the south and designed as a ring road in the Suriçi city fabric. The same situation applies to the urban block 266. Street widths, which varied between 2-3 meters in the Conservation Development Plan and the old traditional pattern, were increased to 5 meters within the scope of the urban renewal project (Figure 8).

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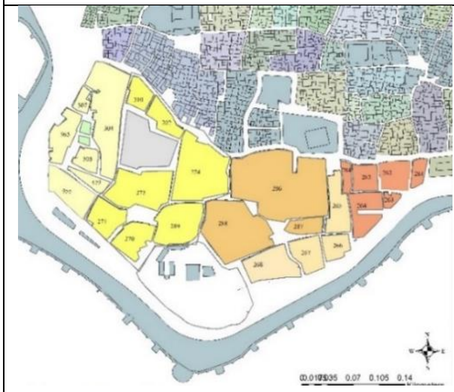
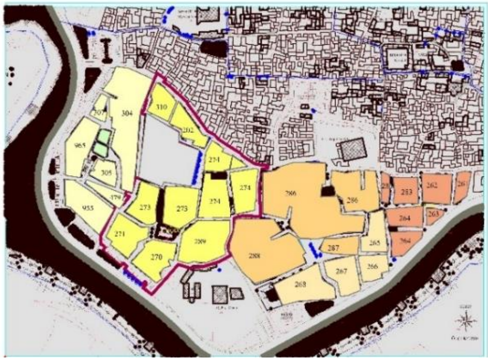
Alipaşa-Lalebey Neighborhood

Urban Conservation Plans (2016 Revision)



Urban Renewal Project



Region No	Urban Block No	The Scale of Urban Blocks According to Urban Conservation Plans (m²)	The Scale of Urban Blocks According to Urban Renewal Project (m²)	Urban Block Dimensions Decrease Percentages
1	955	2295	2227	3
	965	1830	1800	2
	479	706	640	10
	304	5376	5100	5
	305	857	787	8
	307	488	455	7
2	302	1262	1180	7
	270	1830	1757	4
	271	1736	1650	5
	273	3687	3263 (1346+1917)	11
	274	4861	4417 (1150+1353+1914)	10
	316	1019	967	5
3	286	980	957	3
	287	972	850	13
	288	613	568	7
4	265	2011	2001	1
	266	1097	1004	8
	267	1687	1501	11
	268	2601	2430	7
5	261	625	598	4
	262	1440	1364	5
	263	354	306	13
	264	2141	1936	9
	283	1169	990	14
	284	528	348	35

Figure 8. Mapping of the Conservation Development Plan and Urban Renewal Project with the Arcmap Program

When the changes in block sizes in the fifth region are examined, area losses were higher (35%) because the block number 284 intersects on the road axis in 4 directions.

On the road between the urban block Number 264, parcel number 10 was evacuated and connected to the axis in the southwest direction. Changes in street and road widths in all regions have led to pattern losses in the size of urban blocks. However, this change brought about tissue losses and caused some areas previously shown as a single urban block in Conservation Development Plan to be separated by roads. In order to ensure continuity of transportation, especially in the urban blocks numbered 273 and 274 in the second region, the roads were changed in the range of 5-7 meters, and this caused the urban blocks to be divided.

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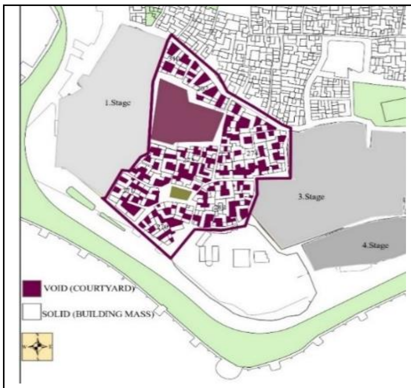
In this context, as a result of the analyses carried out with the Arcmap program, it was determined that there were pattern losses in all regions. However, in addition to the pattern losses in the urban blocks in the second region, the urban block-parcel relationships also changed. In other words, it has been determined that the areas previously designed as a single urban block in the traditional Suriçi urban fabric were divided into 2 or 3 parts to provide road crossings within the scope of the urban renewal project. In this context, instead of searching for the effect of the transformation experienced within the scope of the urban renewal project on passive cooling criteria in 5 regions, the second region, which experienced characteristic differences, was chosen as the study area.

Table 4. Comparison of solid-void percentage of urban blocks within the scope of Conservation Development Plan and Urban Renewal Project (Alipaşa-Lalebey Neighborhood 2nd region)



Urban Conservation Plans (2016 Revision)				Urban Renewal Project		
Urban Block No	The Scale of Urban Blocks (m^2)	Void Volumes (Court)	Urban Density Ratio	The Scale of Urban Blocks (m^2)	Void Volumes (Court)	Urban Density Ratio
316	1019	345	34	967	284	29
302	1262	476	38	1180	404	34
289	3069	997	32	2740	772	28
274	4861	1565	32	4417	1241	28
273	3687	1306	35	3263	668	20
271	1736	652	38	1650	574	35
270	1830	608	33	1757	663	38

As a result of the analyses carried out through the ArcMap program, the urban block pattern losses due to the change in street widths in the second region led to a change in the solid-void percentages. While the percentage of courtyards in the urban blocks located in the second region varies between 32-38% according to the Conservation Development Plan, it has been determined that this rate is between 20-38% within the scope of the urban renewal project. Except for the urban block number 270, the solid-void percentages decreased in all other urban blocks. In other words, within the scope of urban transformation, the courtyard rates and percentages that dominated the traditional Suriçi urban fabric decreased with the urban renewal project. According to the Conservation Plan, the most change was observed in this area due to the division of the urban block by roads to ensure continuity of transportation in the urban block number 273, which was previously a single urban block. In other words, a 15% decrease in solid-void rates was detected in comparing Conservation Development Plan and urban renewal projects.

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Due to the urban renewal project, there was an increase in the solid and void percentages in urban block number 270, leading to a conclusion that it has a different solid-void relationship than other urban blocks in the region. Furthermore, the presence of parcels not recommended for mass use to provide transit (urban block number 274) has caused the solid-void relations in the multi-layered traditional urban fabric and the urban density to change (Table 4).

Pattern losses in the urban block have led to changes in the courtyards and parcel layouts in the traditional Suriçi urban fabric and a decrease in the solid-void ratios. Increasing street widths in the traditional urban fabric has caused artificial gaps to be created by retreating urban blocks in the historically protected area. In other words, within the scope of the urban renewal project, front gardens were created, and the traditional street pattern-courtyard-building relationships were changed. As a consequence of the analyses conducted using the ArcMap program, the widening of streets resulted in ineffective utilization of passive cooling strategies due to shadow effects. Furthermore, the disruption of urban block-parcel-courtyard relationships will induce a heat island effect in the street canyon, leading to thermal comfort degradation in indoor and outdoor spaces. In this context, the upcoming section will discuss and compare the positive and negative attributes of the alterations in the traditional urban fabric concerning passive cooling within the framework of the urban renewal project. This discussion will encompass evaluations at both the street and urban scales.

DISCUSSION

As a result of the analyses carried out through the Arcmap program, the changes and transformations experienced in the Alipaşa-Lalebey Neighborhood Urban Renewal Project were compared with the old city pattern on the scale of climate-responsive design strategies. The urban transformation experienced in the Alipaşa-Lalebey Neighborhood was evaluated within the framework of street pattern, solid-void relationships, and urban block-parcel relations and evaluated on the scale of passive cooling criteria (Table 5). Within the scope of the urban renewal project, the compact urban form, mixed land use, hierarchy of open-semi-open and closed spaces, urban amenities, and green areas have been preserved. This has resulted in the continuation of passive cooling design strategies that dominate traditional urban fabric configurations. However, the creation of front yards and side yards, which were not previously present in the traditional fabric, has led to an increase in street widths, thereby reducing the passive design shadow effect within the traditional fabric.

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Table 5. Evaluation within the Framework of Climate-Responsive and Passive Cooling Design Strategies (Urban Scale)

Evaluation in the Context of Climate-Responsive Design Strategies		**Evaluation of the Alipaşa-Lalebey Neighborhood Urban Transformation Project within the Framework of Passive Cooling System**
Traditional Settlement Area	Urban Renewal Project in Alipaşa-Lalebey Neighborhood	Advantage and Disadvantage
Evaluation On an Urban Scale		
• Compact City Form (Erdemir, 2014; Özdemir, 2016). • Neighborhood unit design based on cultural, religious, and local dynamics. 	• The urban forms included in the Conservation Development Plan have been preserved. • Commercial, religious, and educational functions included in the Conservation Development Plan have been preserved. 	• The compact city form provides energy efficiency due to mixed land use. In the traditional Suriçi urban texture settlement configuration, the compact city form was created in line with microclimatic components such as the sun and wind. These microclimatic elements positively affect passive cooling systems in the hot-dry climate zone.
• Settlement Layout topography harmony • Orientation in all four directions • Mixed Land Use	• The layout was designed regarding the previous topography.	• The fact that the entrances of the buildings are at a lower elevation than the main road shows that passive cooling strategies are used appropriately in topography. • Mixed land use encourages pedestrian access and reduces the use of fossil-based vehicles. This helps to provide a sustainable energy-saving future.
• There are semi-open and open areas and public spaces such as parks and recreation areas.	• Social reinforcement areas and park areas have been preserved. Children's play and recreation areas have been created at the intersections of the streets.	• Semi-open, open areas help provide outdoor thermal comfort by reducing the heat island effect.
• Ensuring public-semi-private space street texture-courtyard hierarchy in transitions to urban areas (Özyılmaz & Sahil, 2017).	• In the Traditional Diyarbakır Street pattern, houses with courtyards directly relate to the street. However, within the scope of the urban renewal project, artificial front gardens were created by withdrawing the buildings.	• The differentiation of building-parcel-urban block relationships disrupted the traditional street texture pattern and decreased the shadow effect. This situation leads to a decrease in the effect of facade surfaces and outdoor climatic comfort.

Within the scope of the urban renewal project, street widths were increased due to security and emergency reasons, and in this context, pattern losses occurred in the urban block areas. The effect of street pattern changes on the passive cooling system is shown in Table 6. The traditional pattern of narrow streets and roads closed to private vehicle use has been changed within the scope of the urban renewal project. Increasing street widths will increase the solar radiation effect, causing facade surfaces to warm up and heat accumulation in floor coverings. This will cause the heat island effect and reduce indoor-outdoor thermal comfort. While narrow streets are a factor that accelerates the wind effect, there will also be a decrease in the wind effect due to increasing street widths. Increasing the street width has made it possible to be accessible to every street or region, which has been identified as an advantage of change by ensuring the applicability of the universal design principle. In addition, in the plan report, parking vehicles on the streets in the residential area is considered an approach aimed at solving the parking problem in the region.

Table 6. Evaluation within the framework of climate-responsive and passive cooling design strategies (street pattern)

Evaluation in the Context of Climate-Responsive Design Strategies		**Evaluation of the Alipaşa-Lalebey Neighborhood Urban Transformation Project within the Framework of Passive Cooling System**
Traditional Settlement Area	Urban Renewal Project in Alipaşa-Lalebey Neighborhood	Advantage and Disadvantage
Evaluation On an Urban Street Pattern		
  • Narrow streets protected from the heat of summer, organic street forms and dimensions in the Suriçi urban fabric emerged due to the positioning of urban blocks and parcels (Tuncer, 1999).	  • As a result of the analyses carried out through the Arcmap program, it was determined that the urban blocks did not comply with the 2016 Conservation Development Plan Revision. • Street setback distance have yet to be conserved. • Urban block pattern losses were observed at the urban scale 3-10%.	• Widening narrow streets will reduce the shadow effect and cause the surfaces to warm up. This will have a negative impact on passive cooling systems. • It has been determined that the orientation of some houses in the parcel layout is not suitable for the hot, dry climate region. This will result in the optimal orientation, which is among the passive cooling design criteria, needs to be achieved.
• As a result of the hot-dry climate effect prevailing in the Diyarbakır Suriçi urban fabric, houses open towards large courtyards, and an inward-looking structure prevails (Tuncer, 1999; Baran, 2017; Oruç, 2017).	• As a result of the digitizations carried out with the help of the ArcMap Program, pattern losses in the urban block caused the solid-void percentage to decrease by 3-15% (except for the urban block number 270).This situation caused the urban block-parcel relationship to deteriorate in the traditional pattern.	• Changing solid-void rates disrupt the traditional street pattern. This will reduce the shadow effect and thermal comfort by increasing the surfaces exposed to solar radiation indoors and outdoors.

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• The principles of conservation traditional houses'courtyard and relationship, solid-void percantage, and spatial components such as original courtyard walls, pools, and the original street covering are accepted (Soyukaya, 2015).	• While the courtyard-street relationship was provided directly in the traditional pattern, in new renewal project, the retreat of the buildings resulted in the formation of a front garden. • The front garden phenomenon does not exist in the street-courtyard relationship in the traditional Suriçi urban fabric. In order to ensure the continuity of the transportation axis, some parcels in urban blocks 274 and 289 were evacuated, and the solid-void relationship of the traditional pattern was changed.	The evacuation of parcels will increase the urban floor surfaces and cause the heat island effect.
Walkable streets - roads that do not allow private vehicle passage - shape the unique pattern (Akın & Koca, 2017; Kara, 2019).	• The organic narrow street pattern has been opened to private vehicle use to adapt to contemporary housing production styles. It has been designed to meet the parking needs of every household. In the third region, the street width, which was 3 meters, was increased to 5 meters. In the 2016 Conservation Development Plan Revision, street widths of 2-3 meters were increased to 5 meters (Regions 3 and 4).	• Services such as security, fire brigade, and ambulance can be delivered to all streets in an accessible manner.
Street widths vary between 1.90 and 2.50 mt, but they appear to increase to 3.00-4.00 mt (Dağtekin et al., 2018). The average width of the inner street is 2.2 meters, sometimes as low as 0.58 meters. Although the street pattern has an organic form, steep roads have caused the formation of	• Transportation axes are designed to allow 5-7 meter comprehensive vehicle passages. • The withdrawal of some building masses for security purposes has led to road widening. In order to provide access to every point in the 1st Region, urban block number 305, the road width has been increased to 7 meters. • In the second region, on urban block number 273, road widths have been increased up to 7 meters to ensure the continuity of the transportation axis and allow emergency passage. When the change in the borders of the urban block in the fourth region is examined, the road widths on the 267th urban block have been increased to 7 meters in order to ensure the continuity of the transportation axis, which is	• Considering the need for contemporary housing design, the parking problem due to today's traffic density has been tried to be solved. • Increasing street width increases the solar radiation effect. • The inability of the shadow effect to reach large surfaces will cause heat gain from the facade surface. • While narrow streets include a design approach that accelerates the wind effect and allows cross ventilation,

When the changes in the street characteristics are examined, the blind facades overlooking the street in the traditional pattern are designed as transparent surfaces in the new residential area. Opening windows on facades facing the street will cause uncontrolled solar radiation to be transmitted to the building surface and interior. This situation will cause indoor thermal comfort to deteriorate, especially in summer, as solar radiation falls on the surface at a very steep angle.

rectangular urban blocks (Akın & Koca, 2017).	located in the south and designed as a ring road in the Suriçi urban fabric. • Transportation axes dividing the urban block and providing transit were created later. 2. Region: 5 mt wide roads were opened in the middle of 274th urban block, and the urban block was divided into three parts.	increasing the street width • It will prevent you from benefiting from the cooling effect of the wind. • Increasing street widths will cause thermal differences in semi-open spaces to increase.
• In the traditional Suriçi street pattern, the facade orientation faces the courtyard for climatic and privacy reasons. Street Silhouette comprises blind facades and bay window passages (Direk, 2006; Ergin et al., 2020). Houses are primarily single and two-storey. • Houses are primarily single and two-storey.. • In areas where historical buildings are concentrated, the number of floors is determined as 2 (Kejanlı & Dinçer, 2011).	• Windows were opened on the facades overlooking the street, and the privacy issue was ignored. • The Conservation Development Plan designed the floor heights that form the street silhouette.	• Opening windows on facades facing the street will cause uncontrolled solar radiation to reach the interior, decreasing thermal comfort.

CONCLUSIONS AND RECOMMENDATIONS

The Historical Suriçi Urban Fabric is a cosmopolitan city that has hosted many past and present civilizations. The fact that the Suriçi region was the city's first settlement made it necessary for daily life to take place in this area for a long time. After 1950, migrations took place from the countryside to the region, and the face of the Suriçi urban fabric began to deteriorate. Due to internal migration, the region's population increased daily, and the housing stock remained insufficient. This situation has led to the emergence of the problem of illegal construction that does not belong to the original pattern. The buildings built by people with different socio-economic levels to meet their own shelter needs without a license have disrupted the continuity of the historic environment. After the conflict in 2015, urban renewal projects began to be implemented in areas that suffered physical destruction in the historical pattern. The reconstruction process initiated in Alipaşa-Lalebey Neighborhood aimed to design new living spaces compatible with the historical environment. In order to ensure the sustainability of the traces of the original pattern in new housing textures, we aimed to revise the Conservation Development Plan and create urban renewal projects in line with this plan. In this context, within the scope of the study, the urban transformation experienced in the Traditional Suriçi urban fabric has already been evaluated within the framework of passive cooling criteria. If the urban renewal project at the street texture scale is compared with the Conservation Development Plan, it can be seen that the urban block sizes, street widths, road network hierarchy and cross-sections, urban surface areas, the street facade are not designed by the Conservation Plan

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(Table 7). It has been shown that the pattern losses experienced in urban blocks will increase the street flooring areas, leading to the heat island effect and disrupting indoor-outdoor thermal comfort. It has been determined that the changes in the façade silhouette and characteristic features of the new housing texture are unsuitable for the design approach based on the original pattern.

Table 7: Changes in the Effects of Alipaşa-Lalebey Neighborhood on Passive Cooling Criteria

Passive Design Criteria		Effect on Passive Cooling Criteria
Urban components are protected according to the Conservation Development Plan	Compact City Form and Urban Density	In the traditional Suriçi urban pattern settlement configuration, the compact city form was created in line with microclimatic components such as the sun and wind. High-density and compact city form contributes to thermal comfort by increasing the shadow effect in urban areas.
	Mixed Land Use	Mixed land use encourages pedestrian access and reduces the use of fossil-based vehicles. This helps to provide a sustainable energy-saving future.
	Courtyard Settlement Pattern	Courtyard typology, which is shown as the most effective form of urban shading in hot-dry climate regions, is a form that shows high performance in terms of outdoor thermal comfort, daylight potential, natural ventilation, and cooling loads. The ratio between the height of the buildings (H) and the width of the courtyard (W) increases thermal comfort by reducing solar radiation in hot and dry climates.
	Parks and Recreation Areas	Recreation areas with both public and microclimatic effects provide outdoor thermal comfort in the hot-dry climate region.
	Ensuring Public-Semi-Private-Private Space Hierarchy in Transitions to Urban Areas	Conservation of spatial hierarchy is essential for urban memory and urban identity...
	Floor Heights and Silhouette	The floor heights of the reconstructed buildings were designed following the traditional houses.
	The Scale of Urban Blocks	There were losses in urban block sizes in all five regions. Increasing urban surfaces

Changing components in the urban fabric of Suriçi within the scope of the Urban Renewal Project		will increase street pavements' surface temperature and cause heat island formation. Pattern losses in the urban block will reduce the shadow effect and cause the facade surfaces to warm up, decreasing indoor thermal comfort. This will result in passive cooling design inputs needing to be used optimally.
	The Scale of Parcel	Some parcels have been evacuated to ensure security and emergency transitions. The change in the layout has also altered the sizes of some parcels on the urban block. Consequently, the shadow effect and the courtyard-parcel relationship have been disrupted.
	Street Width	Some parcels were evacuated to ensure security and emergency passage. The change in urban block size has also changed some parcel sizes. In this context, the shadow effect and the courtyard-plot relationship are disrupted.
	Solid-Void Relationship	The decrease in solid-void percentages has disrupted the organic compact narrow street pattern. The decrease in the shadow effect will increase the surfaces exposed to solar radiation, leading to the heat island effect. This will result in passive cooling strategies not being used effectively.
	Street Pattern -Courtyard Relationship	The retreat of the buildings has led to the formation of the front garden concept, which is separate from the traditional pattern design approach. The change in the building-plot-block spatial hierarchy has caused the courtyard ratios to decrease and the solid-void relationship to change. This situation will lead to a temperature increase due to the shadow effect and affect the applicability of passive cooling strategies.
	Road Network And Hierarchy	The width of the main arterial roads in Suriçi city center has been increased due to emergency reasons, and passages to the main arteries have been provided from all urban blocks. In addition, roads have been opened between the streets to ensure the continuity of urban block crossings. This situation disrupted the road hierarchy and prevented the application of passive cooling strategies based on the shadow effect.
	Road Cross Sections	It has been determined that road widths increase in cross sections, and all arteries are designed to allow vehicle passage. This will result in the formation of more exposed surfaces to the sun and will lead to the heat island effect.

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	Street Facade Character	Within the scope of the urban renewal project, window surfaces were opened on all street facades. This will cause uncontrolled penetration of solar radiation into the building through transparent surfaces, decreasing indoor thermal comfort.

Traditional urban fabric and building typologies in hot-dry climate regions were designed using climate-responsive design strategies. They provided indoor and outdoor thermal comfort throughout the year without relying on mechanical or electrical-based systems. Especially in recent years, the climate crisis and the consumption of energy resources have changed the design approaches developed on an urban and architectural scale. Urban and building-scale design approaches have been developed by considering systems that take climatic features as a reference and are not dependent on any energy source. In this context, in the hot, dry climate region, passive cooling systems have been used in the traditional urban fabric and have guided today's contemporary building design. This study emphasizes the importance of developing design approaches that consider today's conditions and requirements and can use climate-responsive and passive systems when renovation work is carried out in a historical pattern. In addition, during the time until the reconstruction process's decision and implementation, design decisions considering the Conservation Development Plan should be made, and local and public administrations should carry out legal follow-up during the construction phase. This study has also shown that urban transformation projects not carried out per the Conservation Plan in a traditional pattern will disrupt the continuity of cultural heritage. In addition, the loss of urban blocks in the traditional fabric, the change in solid-void relations, and the differentiation of street patterns will not only destroy cultural heritage. However, it will also cause the characteristic approaches of many geographical designs to be kept from the next generation.

As a result of this study, a proposal can be presented to create an energy-efficient urban block and street pattern with an energy-efficient, sustainable, and integrated design approach that takes into account both local and today's contemporary conditions in transformation projects carried out in the historically protected area, with knowledge-based analyzes that take historical climatic design as a reference.

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Resume

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