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Typological Traces as An Identity Element in the Urban Form: the Case of Kunduracılar Street in Trabzon

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Abstract

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Commercial streets in historic city centers play essential roles in their economic activities and spatial structures on urban identity. Nevertheless, the main elements of their identity are generally explained in terms of their socio-cultural values or visible design criteria, while their typological continuity is another element. This study aims to conduct a typological analysis of Kunduracılar Street, located in the historic city center of Trabzon. Within the research, the street and plot system, building types, and facade arrangements were analyzed by using old and current maps, field studies, and photographs. The research showed that the street is characterized by a commercial building typology developed on narrow-fronted and deep plots. The commercial use in ground floors and repetitive facade elements also has a significant effect on strengthening the characteristics of the street. The study highlights the contribution of the typological continuity of historic axes in the formation of urban identity.

Keywords: Typomorphological Analysis; Historic Commercial Streets; Urban Identity; Kunduracılar Street; Building Typology.

1. Introduction

Commercial streets in historic city centers are not only spatial axes reflecting the economic history of cities but also public spaces that play a significant role in shaping urban memory and identity. Physical components such as the street system, parcel structure, and building pattern make the historical continuity of these areas visible, thereby enabling an understanding of the city's unique spatial character. This relationship between long-standing patterns of use and the physical structure of traditional commercial axes is considered one of the fundamental elements that reinforce the continuity of urban identity. In this context, urban morphology studies that examine the physical formation of cities and their changes within historical processes contribute to the analysis of spatial transformation and continuity. In this context, typomorphology—one of the key approaches in urban morphology that goes beyond merely defining the existing physical characteristics of the urban fabric to enable a comprehensive evaluation of the relationships between the street system, parcel patterns, and building patterns within a historical process—contributes to the interpretation of both the transformations that the urban space has undergone over time and the morphological features that demonstrate continuity, and thus helps to identify the fundamental components that shape the character of historic urban fabrics. In this regard, it provides an important theoretical and methodological framework, particularly for preserving the traditional spatial character of historic commercial districts and for evaluating processes of change.

Located in the city center of Trabzon, the historic Kunduracılar Street is a major commercial thoroughfare that largely retains its traditional function and stands out in urban identity for its unique parcel structure and repetitive architectural character. However, existing studies in the literature have primarily focused on the street's historical or functional characteristics, with limited evaluations of typological continuity and morphological structure. In this context, this study aims to examine the street system, parcel pattern, and building pattern characteristics of Kunduracılar Street using typomorphological analysis methods, thereby elucidating the role of historic commercial streets in the formation and maintenance of urban identity through the lens of this street in Trabzon. The findings of this study are intended not only to evaluate the historical spatial character of Kunduracılar Street from a typomorphological perspective but also to serve as a comparative reference for future typomorphological research on similar historic commercial streets in the city of Trabzon.

1.1. The Role of Commercial Streets in Urban Identity

Throughout history, urban spaces have undergone constant transformation under the influence of social, economic, political, and technological dynamics and are subject to physical change. While this transformation in the physical environment can play a constructive role in adapting the space to changing needs, it can also lead to spatial degradation, loss of quality, and the weakening of urban identity and collective memory. Commercial streets, particularly those in city centers, are the spatial components where this change occurs most effectively. As focal points of economic activity and spaces where social interaction occurs and cultural and urban memory is produced, commercial streets directly influence the formation and continuity of urban identity. Studies conducted in recent years have shown that historic commercial streets should be regarded not merely as spaces serving a commercial function, but as urban heritage areas that integrate architectural, economic, social, and historical values. These streets, which make a city's historical memory visible, are public spaces that constitute an important part of the city's collective memory, strengthening local identity and fostering a sense of belonging. For this reason, the preservation of historic commercial streets is important not only for the continuity of the built environment but also for the sustainability of urban identity and cultural continuity (Shehab El-Deen et al., 2024).

These streets, which play a decisive role in shaping city centers, change lines with evolving land uses, property structures, and planning decisions. Factors such as population growth, functional changes in the city, and zoning plans lead to significant transformations in both the physical fabric and functional structure of commercial streets. Particularly since the post-modernist era of the 20th century, the accelerating pace of transformation in urban spaces has turned them into rapidly consumed and reproduced commodities. This situation has also brought about profound changes in the physical fabric, land use, and functional structure. Given the increasing and diversifying needs, understanding the evolving dynamics of these spaces within the city center—which are constantly undergoing restructuring not only in their physical fabric but also in their social and functional aspects—is critical (Ardıçoğlu, 2024). Recent research shows that the revitalization of historic commercial streets is not limited to the built environment; it also affects social life, cultural memory, and public life. As a result of the development of new commercial centers shaped by urbanization pressures and changing consumption habits, historic streets face the risk of losing both tangible and intangible cultural values. For this reason, it is emphasized that physical, social, and cultural components must be considered together when evaluating these areas (Teba et al., 2024). Similarly, Mehanna and Mehanna (2019) note that traditional commercial streets in historic city centers embody historical, architectural, economic, and social values that have emerged through natural development processes; consequently, they should be regarded as a key component of a city's historical identity. According to the authors of the study, the physical and functional deterioration occurring in these streets weakens not only the spatial quality but also the city's historical identity and collective memory.

By systematically examining these processes of change occurring in the urban environment, urban morphology constitutes an important field of research for understanding the current state of the urban environment and developing appropriate intervention strategies for the future. Urban morphology, which presents a fundamental approach to examining the physical components of the urban landscape—such as street fabric, parcel structure, and building typologies—throughout historical processes, analyzes physical change and the factors driving it from the past to the present using written and visual sources (Whitehand & Larkham, 2000). However, recent studies have emphasized that, in assessing historic commercial streets, it is necessary to consider not only physical changes but also the vitality of the street space, pedestrian use, the quality of public space, and the user experience; it is widely accepted that the relationship between the social and economic sustainability of these commercial streets and their spatial quality serves as an important evaluation criterion for understanding the contribution of these areas to urban identity (Zhang et al., 2024).

Urban identity is defined as a dynamic, multi-layered structure formed by the integration of the physical, social, cultural, and historical elements that distinguish a city from others. Consequently, identity is shaped not only by the visual and formal characteristics of a space but also by the processes of meaning and experience that individuals establish with that space (Oktay, 2011). Streets and alleys, fundamental components of public space, intensify social interaction, shape daily practices, and ensure the legibility and continuity of urban identity. In this context, commercial streets emerge as one of the strongest carriers of urban identity (Özalp, 2008, as cited in Ayyıldız & Ertürk, 2017). In the current literature, the relationship between commercial streets and urban identity is explained in terms of their holistic spatial structure—comprising historical continuity, public life, local culture, architectural character, and user experience—and it is argued that the preservation of the identity of such streets depends solely on the preservation of historic buildings, the continuity of public life, cultural activities, and the preservation of local character (Hagag et al., 2025). In particular, commercial streets that combine diverse functions, are accessible at a pedestrian scale, and exhibit continuity contribute to the formation of urban identity by enhancing vitality.

Current conservation approaches demonstrate that preserving individual buildings is insufficient to maintain the unique identity of historic commercial streets; rather, the street's character, commercial continuity, forms of public use, and the physical environment must be addressed holistically. In this context, historic commercial streets are regarded as fundamental public spaces that ensure cultural, spatial, and social continuity between the past and the present and make the city's identity visible (Shehab El-Deen et al., 2024). Morphological characteristics such as the layout of parcels, the character of building facades, and the use of ground floors—which have emerged from long-term development—play a significant role in ensuring the spatial identity and typological continuity of commercial streets. For this reason, commercial streets are regarded as spatial systems where urban identity can be discerned not only through economic activities but also through typomorphological continuity.

1.2. Typo-morphology and Identity Relation

In the field of urban morphology, where researchers from various disciplines work, the fundamental theories emerged within the disciplines of geography and architecture, and three distinct approaches have developed to explain the formation and transformation of urban form. The Conzen approach, which forms the foundation of the British school, examines the processes that shape the physical form of urban space from a historical perspective, analyzing the development of settlements over time through morphological components such as the street system, parcel structure, and building fabric (Conzen, 1960). By comparing maps from different periods and revealing the layered structure of the urban fabric, this approach offers an analytical, history-based framework for explaining changes in urban form, thereby enabling an understanding of this transformation.

Emerging largely as a critique of the modernist approach to planning, the French school was developed by researchers such as Jean Castex, Philippe Panerai, and Jean-Charles Depaule; it represents an approach that combines both morphological analyses and typological readings, bridging the gap between the British and Italian schools (Moudon, 1994; Moudon, 1997). In studies within the French school, the concept of “urban architecture” is addressed through urban analyses and typomorphological research, and is directly integrated into the fields of planning, conservation, and urban design (Bilsel, 2018).

Unlike conzenian analysis, the Italian school—which examines not only the morphological components of urban form but also the building typologies that generate these components and their historical transformations—was shaped by the works of Saverio Muratori and Gianfranco Caniggia, thereby establishing the theoretical foundation of the typomorphological approach. Caniggia’s concept of the “typological process,” which demonstrates that building types have evolved into the fundamental determinants of urban form, stands out as a comprehensive analytical method that enables urban space to be interpreted through the relationship between continuity and change. Muratori, on the other hand, proposes the active use of historical knowledge to understand urban form by defining cities as “organisms” that develop within historical continuity and by introducing the concept of “operative history” (Cataldi et al., 2002). The typological approach developed within this framework enables the analysis of the multi-layered structure of urban space through the concepts of “type,” “fabric,” and “urban organism.”

In these three schools of thought, which interpret changes in the urban landscape through its physical components, the typomorphological approach—particularly as articulated by the Italian school—enables the analysis of this transformation through building typologies. This demonstrates that urban morphology is a holistic discipline that addresses the geographical, historical, cultural, and sociological dimensions of the city in a comprehensive manner (Moudon, 1997; Rossi, 2006). The typological approach, which offers a holistic interpretation through the relationships between historical continuity and spatial organization, emerges as a decisive factor in the formation of urban identity. Commercial building typologies that develop along narrow facades and deep lots enhance the spatial legibility of urban identity and ensure the continuity of the urban fabric through ground-floor usage patterns and repetitive facade characteristics. A review of the literature reveals that such commercial streets are typically analyzed in terms of their socio-economic or functional dimensions. An examination of typomorphological studies conducted in recent years shows that this approach provides a robust framework for understanding the processes of continuity, change, and transformation in the urban fabric across different scales and contexts. In this context, Rahbarianyazd (2020), in a study examining the residential fabric in Famagusta, Cyprus, combined the approaches of Conzen and Caniggia to analyze the street system, parcel typology, building and facade typology, and land use as defining components of the physical revitalization process. Similarly, Yelken Kar et al. (2026) emphasized that typomorphological rules derived from the relationships between streets, parcels, and buildings in traditional settlements provide a systematic framework that can be applied to contemporary urban design decisions; demonstrating that typomorphological analysis is not merely a means of deciphering the existing urban fabric, but can also be used to develop context-sensitive new urban design approaches through the interpretation of local morphological codes. Emphasizing the importance of typomorphological studies in the preservation and renewal of historic areas, Song et al. (2023) demonstrated that this process can be made more systematic through digital methods, thereby enabling the development of different intervention strategies. Sunaryo et al. (2022), in their study conducted in Kasongan—a rural-urban area with agricultural resources located between Bantul and Yogyakarta—demonstrated that typomorphological analysis can be used to identify local identity by interpreting the changes over the past 60 years through three categories: spatial patterns that persist as the initial identity, those that have changed, and those that have disappeared. Milani (2021), who examined the typomorphological transformation of residential buildings in Tehran, assessed this transformation through the relationship between regulations and spatial configuration; Çalışkan et al. (2025), on the other hand, proposed a “metric typomorphology” framework for defining the building fabric using quantitative indicators. In another study examining the relationship between typological diversity and morphological continuity in the residential fabric of Ankara, Turkey, it was demonstrated that typological differentiation, when not guided by design and development controls, can lead to fragmentation in the urban fabric (Çalışkan et al., 2023). While these studies demonstrate the importance of the typomorphological approach in terms of conservation, renewal, the development of design guidelines, identity analysis, and the assessment of morphological continuity, it is evident that the existing literature primarily focuses on residential areas, historic districts, or the general built environment; consequently, studies examining the relationship between typological continuity and urban identity in historic commercial streets remain limited. Therefore, the typomorphological analysis of Kunduracılar Street offers a unique contribution to understanding the relationship between typological continuity and urban identity in historic commercial thoroughfares.

In this context, this study aims to analyze the typomorphological characteristics of Kunduracılar Street—one of the historic commercial streets in the city center of Trabzon—and to identify the spatial continuities that contribute to the formation of urban identity through the street fabric, parcel pattern, building typology, and façade arrangements. Within the scope of this study, the street’s historical development process and its current physical structure will be evaluated

together based on typomorphological theories; in this way, an effort will be made to explain how the relationship between typological continuity and urban identity is established.

2. Materials and Methods

A typo-morphological analysis was conducted on Kunduracılar Street, which was determined as the study area. Within the scope of the typo-morphological analysis, the parcel pattern, building pattern, and street system of Kunduracılar Street were examined. The street system and figure-ground pattern were analyzed diachronically between 1968 and 2026, while parcel sequence and the buildings located on the parcels that define the street were analyzed synchronically. The urban form elements examined in the study area were evaluated for their continuity over time and the contribution of that continuity to urban identity. As a result of the analyses, the building types, parcel and facade rhythms that contribute to the identity characteristics of Kunduracılar Street, and the relationship of these elements with the street system were explained. The 1968 Trabzon Province Analytical Studies, the 2015 Trabzon Development Plan, and current city maps were used in the analyses. The drawings of the street system, parcel, and building texture prepared for the analyses were created in 2D using CAD software and visualized with Photoshop (Figure 1).

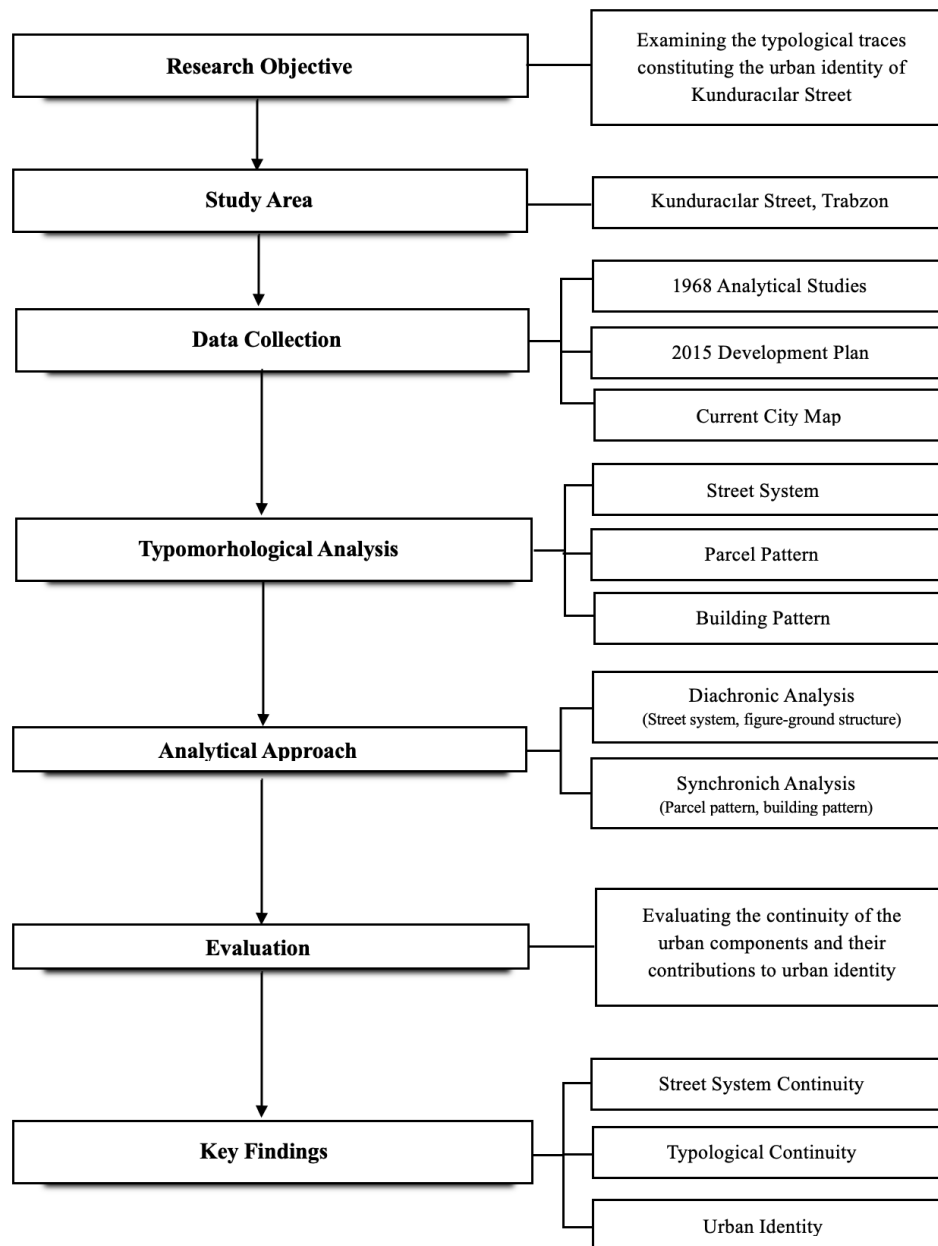


Figure 1. Research Methodology Framework (Developed by the Authors).

3. Field Study

3.1. Study Area

Kunduracılar Street is one of the oldest commercial axes in Trabzon. It is located in the Kemer kaya Neighborhood, one of the three parallel commercial axes in the city center, along with Uzun Street and Maraş Avenue. The street runs east-west, bordered by Gazipaşa Avenue to the east and Cumhuriyet Avenue to the west—the existence of the Kunduracılar street dates to the end of the 1900s. The street facades of the buildings feature rich architectural elements, indicating that aesthetic values have been a priority for the street (İbiş, 1993, p. 74). The street reflects its history through buildings of different ages and types, creating a multicultural landscape. While the street was pedestrianized and announced a registered area in 1985, its defining elements were gradually disrupted by urban development and change (Çevik et al., 2008). Kunduracılar Street has essential connections in the city center. Connecting to the Maraş Avenue with the streets on it, to the Meydan Area, which is the core of the city center in the south, and the Moloz area in the west, makes the street an inevitable physical and cultural intersection for people and their urban experience.

Previous studies on Kunduracılar Street have revealed that, in addition to being a historic commercial axis, the street serves as a significant urban focal point that reflects the city of Trabzon's multi-layered cultural structure, spatial continuity, and urban identity. Approaching the area as the historical pedestrian-commercial backbone of Trabzon's city center, Çevik et al. (2008) emphasized that the architectural characteristics of the buildings along the street, spanning various periods, reflect the city's multicultural structure within the urban fabric. In this study, which addresses the negative impacts of visual clutter, unregulated development, and functional transformations on the historical environment, the effects of renovation and revitalization initiatives on spatial quality, pedestrian use, and urban life are discussed. Bayram (2025), on the other hand, examined the building facades on Kunduracılar Street within the framework of fundamental design principles, evaluating the effects of design elements such as repetition, harmony, rhythm, and unity on the street's silhouette and user perception, thereby demonstrating that facades serve as identity elements possessing the quality of an 'urban interface.'

While these studies demonstrate that Kunduracılar Street holds significant urban value in terms of physical, aesthetic, and cultural continuity, they also highlight the need for a comprehensive examination of the relationship between the street's typomorphological characteristics and the city's identity. In this context, Figure 2 illustrates the location of Kunduracılar Street within the city and the boundaries of the study area, highlighting its role as a key component of Trabzon's urban identity through its historical continuity and morphological character.

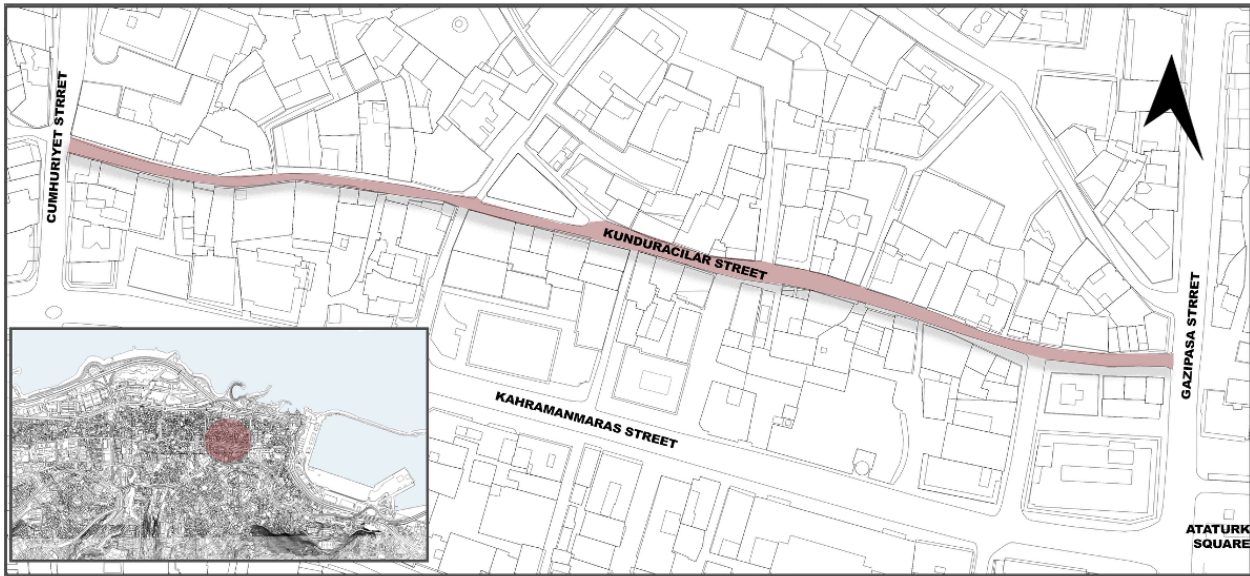


Figure 2. Study Field.

3.2. Typo-Morphological Analysis

The scope of the typo-morphological analyses was determined by the content of the material acquired during the study. In this context, the street system and figure-ground pattern were analyzed diachronically, from 1968 to the present. The parcel, building pattern, and street silhouettes were analyzed synchronically using current data, while also considering transformations observed over time.

3.2.1. Street System

Kunduracılar Street is located between Cumhuriyet Avenue in the west and Gazipaşa Avenue in the east. The street's form is organic, but it maintains a linear connection between these two axes. The width of the street differs along the way, ranging from 5 meters to 10 meters in various spots. While the main form of the street remains largely the same over time, the streets connecting to Kunduracılar Street from the north and south change. These changes are seen in both form and in the connection type. While today, new connections are not observed, it is seen that the remaining connections are developing. All of the changes observed in the study area are seen in cul-de-sacs; 3 of them got longer routes today, while one of them disappeared over time. When the number of street intersections is examined, it is also evident that it decreases over time. It may be related to the transformation of the main type of transportation on the historic street. Today, the street is a pedestrian axis that is opened to service traffic in a controlled manner at specific hours, while it was open to vehicular

traffic in the past. This situation could cause different street expressions on related maps used for analysis. Since it is not possible today to determine the exact number of intersections, the analysis was conducted using the numbers that can be observed in the acquired materials.

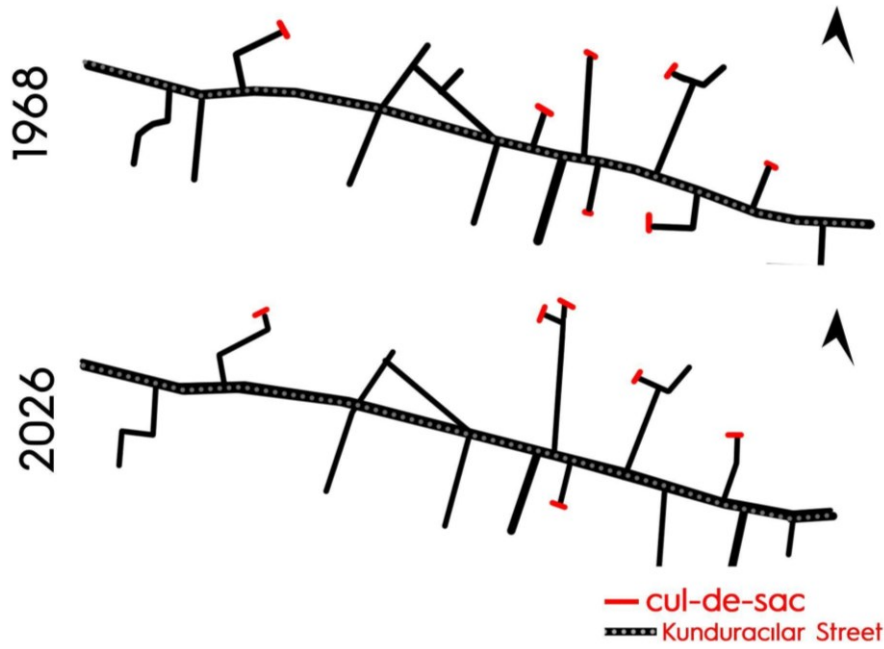


Figure 3. The street system in 1968 and 2026 (Prepared by the authors by using İller Bankası archive and Trabzon Büyükşehir Belediyesi archive).

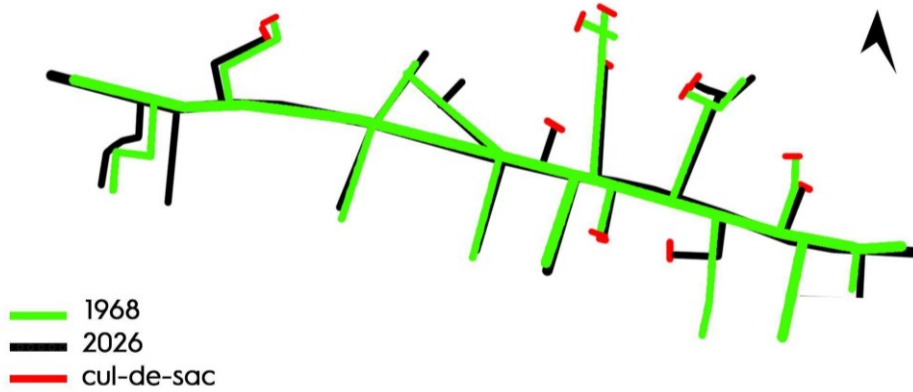


Figure 4. Superposition of the street system in 1968 and 2026 (Prepared by the authors by using İller Bankası archive and Trabzon Büyükşehir Belediyesi archive).

3.2.2. Parcel Pattern

The parcel pattern of the Kunduracılar Street has an irregular system (Figure 5). The form and the size of the parcels vary widely. While the smallest parcel on the street is almost 5 m², the biggest one is almost 680 m². It is assumed that this situation is a result of the amalgamations and subdivisions that occurred over time. However, in some parts of the parcel sequence, specific parcel types appear in consecutive order, with similar form and size as a type feature. According to that pattern, repetitive parcel groups are detected on the street. While detecting them, the number of repetitive parcels on the facade was considered to classify them as parcel types. If the parcel group constitutes a majority on the facade, it is defined as a parcel-type group. As a result, 4 different parcel types were detected, and all of them are located in the northern part of the street. Since only four parcel types have been detected, it is inevitable to emphasize the narrow parcel sequence across different urban blocks, which affects adjacent buildings and the street rhythm and facade continuity.

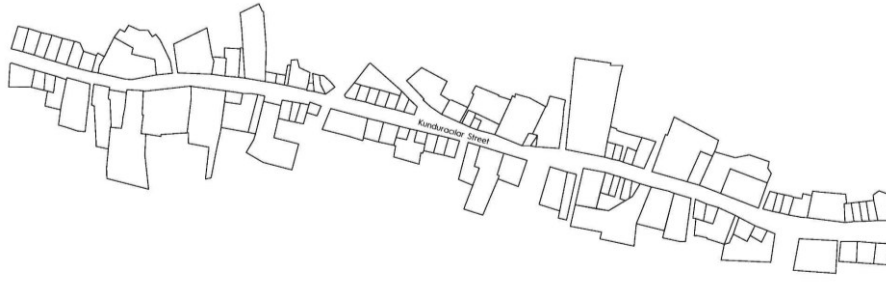


Figure 5. Parcel Pattern of the Study Field (Prepared by the authors by using the Trabzon Büyükşehir Belediyesi archive).

Parcel types were named as Type A, Type B, Type C, and Type D. Their sizes, width-depth ratios, and forms are listed in Table 1. When the forms and sizes of the parcel types are examined, it is seen that the proportions of the facade width and depth differ. The width-to-depth ratio of parcel types is 1:2 for Type A and C parcels; 2:3 for Type B parcels, and 1:2,5 for Type D parcels. These ratios show that the major parcel form for the street is narrow-fronted and deep plots in rectangular form.

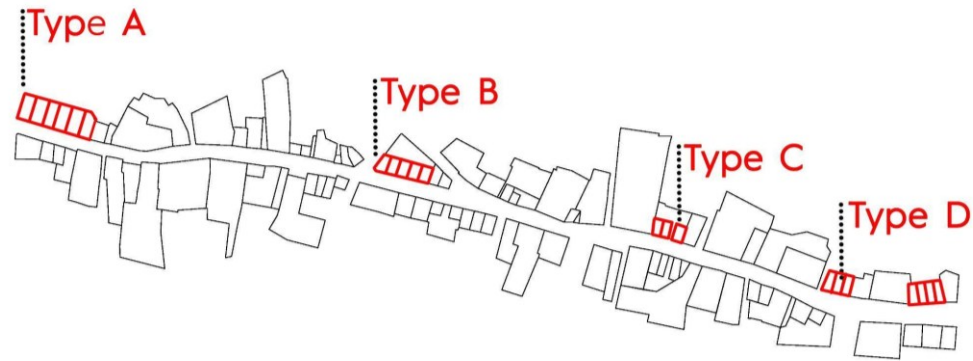


Figure 6. Parcel Types in the Study Field (Prepared by the authors using the Trabzon Büyükşehir Belediyesi archive).

Table 1: Parcel Type Features in the Study Field (Prepared by the authors by using the Trabzon Büyükşehir Belediyesi archive).

Parcel Type	Parcel Form	Parcel Width	Parcel Depth	Width-Dept Ratio
Type A	Rectangular	~4.80 m	~9.60 m	1:2
Type B	Rectangular	~4.00 m	~6.00 m	2:3
Type C	Rectangular	~3.00 m	~6.00 m	1:2
Type D	Rectangular	~3.00 m	~7.50 m	1:2,5

3.2.3. Building Pattern

When the building pattern between 1968 and 2026 was examined, the figure-ground map shows that all buildings are constructed in an attached order in both years, and there seem to be minor changes in the density of the settlement pattern (Figure 7).

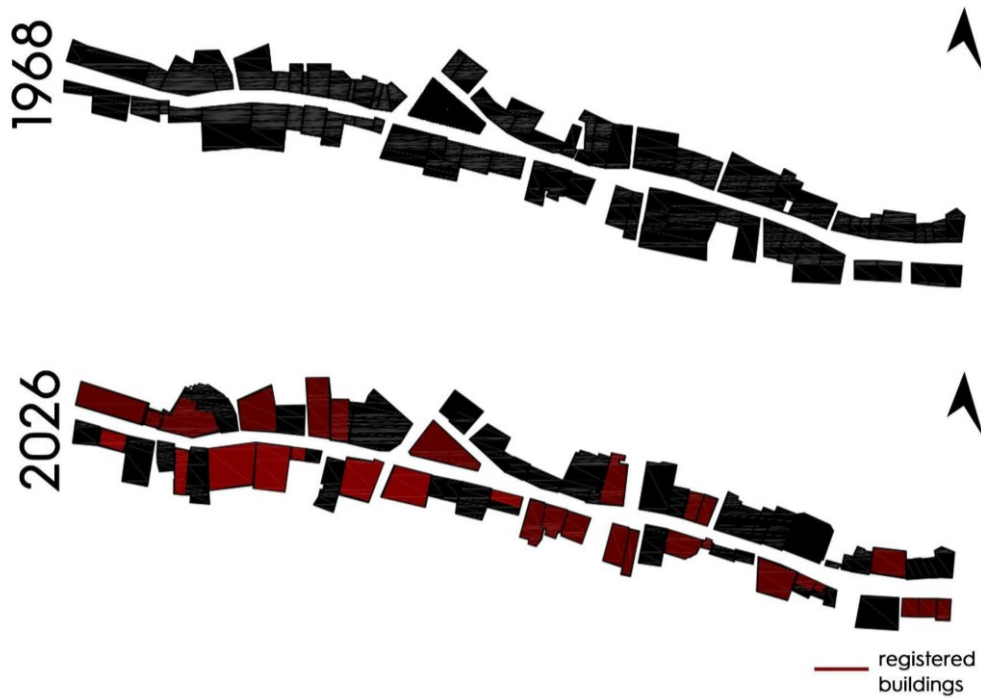


Figure 7. Figure-ground map of the study field in 1968-2026.

Since the street's physical features in the past could not be detected as they are today, the building pattern is mostly examined synchronically. In this context, when the parcel and building relations are examined today, it is observed that while most buildings fully occupy their plots, some plots are used for rear gardens. All buildings are aligned with the street frontage (Figure 8).



Figure 8. Superposition of the parcel and building pattern in 2026.

Within the research, the transformation of the building pattern could not be traced effectively due to the lack of material. However, it is known that the study area, as a historic axis in the city center, faced pressure from urbanization in the past. The number of stories in the buildings on the street may be used as evidence of this situation. The northern and southern street silhouettes are shown in Figure 9. The silhouettes were drawn based on the current story data obtained from the city maps. One story is accepted as 3 meters as standard for the drawings. When the silhouettes are examined, the order of the buildings does not seem regular, as taller buildings disrupt the sequence. In Table 2, the distribution of stories across both facades shows that the street consists mostly of 2- and 3-story buildings. Buildings with 1 and 6 stories are the least common. The southern side of the street can be considered the denser and more transformed part, as it has the tallest buildings and the most stories overall.

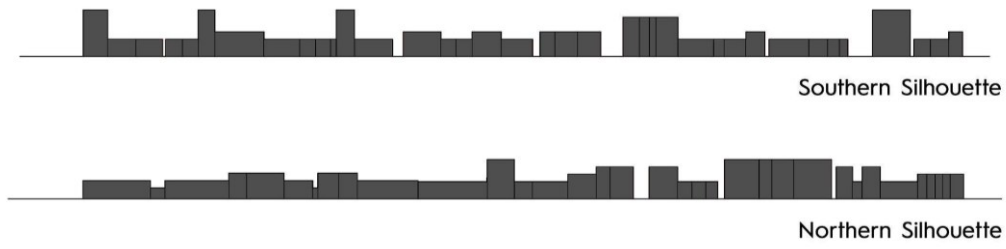


Figure 9. Northern and Western Silhouettes of the Kunduracılar Street in 2026.

Table 2: Building Story Numbers and Distributions on Street Facades in 1968 and 2026.

	1 Storey Buildings	2 Storey Buildings	3 Storey Buildings	4 Storey Buildings	5 Storey Buildings	6 Storey Buildings	Total Number of Buildings	Total Storey Number
Northern Facade	1	12	10	5	5	-	33	100
Percentage	%4	%36	%30	%15	%15	-		
Southern Facade	-	21	8	-	4	4	37	110
Percentage	-	%56	%22	-	%11	%11		

Kunduracılar Street, as a historic axis, contains numerous registered buildings. These buildings represent various historical eras and have characteristic features on their facades. Nevertheless, even if the buildings were built in different years, the street's silhouette appears harmonious and coherent in terms of materials and facade ratios (Figure 10). Within the study, when the buildings located on the parcels determined as type were examined, it was observed that Type A, Type B, and Type C parcels also had registered buildings (Figure 11).



Figure 10. Kunduracılar Street from different perspectives (Beliz Büşra Şişman's archive, 2026).



Figure 11. The Buildings located on Type A, Type B, and Type C consecutively (Beliz Büşra Şişman's archive, 2026).

4. Discussion and Conclusions

When the transformation process and morphological features of Kunduracılar Street were evaluated, each element considered within the process demonstrated significant morphological developments related to the street's identical features. Below, they are elucidated in relation to related urban form elements.

- **Street System:** Analyses reveal that while the continuity of the main street axis has been preserved throughout history, the relationships between the streets connecting to it have changed over time. Due to the growing need for accessibility and integration, the number of street intersections has increased, new connections have been established, and cul-de-sac streets have also been created. These cul-de-sac streets, which reflect the continuity of the traditional

spatial character unique to Trabzon's historic urban fabric within the street system, significantly contribute to the legibility of Kunduracılar Street's distinctive spatial identity and historical continuity, and thus to the urban identity.

- **Parcel Pattern:** Since the historical development of the parcel pattern cannot be traced diachronically, the parcel types defined in this study provide important morphological data on urban identity. In particular, the concentration of registered buildings on specific parcel types demonstrates that the parcel structure is not merely a physical element but also a decisive factor in preserving historical identity and ensuring the legibility of spatial continuity.
- **Building Pattern:** Analyses of the building pattern reveal that the street has become denser over time in both two and three dimensions. While physical transformation has become more pronounced on the south side, where commercial use is particularly concentrated, the existing spatial character and building continuity have been largely preserved on the north side, where residential use predominates. Although transformation is more intense on the southern facade, the higher number of listed buildings on this side suggests that this area is where the influence of the historic fabric remains most clearly discernible today.
- The concentration of registered buildings on the Type A, Type B, and Type C parcels identified in this study demonstrates that certain parcel types have been preserved over time, ensuring continuity in the formation of the street's identity. It can be concluded that these recurring structures within similar parcel patterns not only contribute to the preservation of facade rhythm and spatial integrity but also emerge as a fundamental morphological element that supports the urban identity by embodying the unique historical character and legibility of Kunduracılar Street.

In conclusion, the study reveals that urban form elements such as the street system, parcel structure, and building layout are strongly linked to the formation, preservation, and legibility of urban identity through historical continuity and typological character.

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Funding, Conflicts of Interest

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Data Availability Statement

The data supporting the findings of this study available from the corresponding author upon reasonable request.

Institutional Review Board Statement

Not applicable. This study did not involve human or animal subjects requiring ethical approval.

CRedit Author Statement

Conceptualization: Esra T., Beliz Büşra Ş.; Methodology: Esra T., Beliz Büşra Ş.; Investigation: Esra T., Beliz Büşra Ş.; Formal analysis: Esra T., Beliz Büşra Ş.; Visualization: Esra T., Beliz Büşra Ş.; Writing – original draft: Esra T., Beliz Büşra Ş.; Writing – review & editing: Esra T., Beliz Büşra Ş.; Supervision: Esra T., Beliz Büşra Ş. All authors have read and approved the final manuscript.

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